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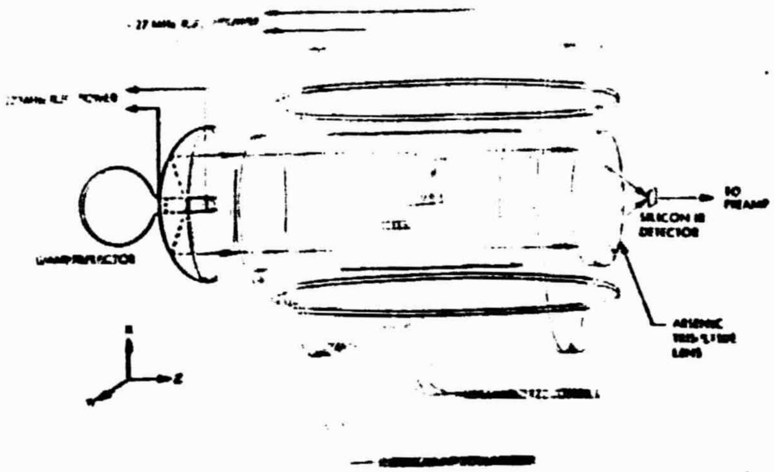
International Solar Polar Mission

Final Report For The



HED 02

Vector Helium Magnetometer

(NASA-CR-169064) INTERNATIONAL SOLAR POLAR MISSION: THE VECTOR HELIUM MAGNETOMETER Final Report (Ball Aerospace Systems Div., Boulder) 243 p HC A11/MF A01 CSCL 22B

N82-26380

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INTERNATIONAL SOLAR POLAR MISSION

FINAL REPORT FOR THE

VECTOR HELIUM MAGNETOMETER

PREPARED FOR: DR. ED SMITH
JPL UNDER CONTRACT NO. 955481

FEBRUARY, 1982

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Dean D. Aalami

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PROGRAM MANAGER

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FUNCTIONAL REQUIREMENTS

1628-11, Rev. B

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International Solar Polar Mission.

Functional Requirements for the Vector Helium Magnetometer (VHM):

ESA Spacecraft Flight Equipment

National Aeronautics and
Space Administration

Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California

1628-11, Rev. B

International Solar Polar Mission

Functional Requirements for the Vector Helium Magnetometer (VHM)

ESA Spacecraft Flight Equipment

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Jan. 1982	Reissued as Revision B; all change bars deleted	All

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1. SCOPE

This document contains the functional requirements for the Vector Helium Magnetometer (VHM) on the European Space Agency (ESA) Solar Polar Spacecraft. The VHM is one of the two magnetometers on board that will measure the vector magnetic field along the Earth-to-Jupiter transfer trajectory, as well as in the vicinity of Jupiter and along the solar polar orbit following Jupiter encounter. Figure 1 illustrates the interconnection between these two magnetometers and their shared data processing unit.

2. APPLICABLE DOCUMENTS

2.1 Applicable sections of the following documents form part of this Functional Requirement.

European Space Agency, International Solar Polar Mission Documents

ISPM-P-0200	ISPM Experiment Interface Document, Part A.
ISPM-PD-0129	ISPM Experiment Interface Document, Part B, Experiment "HED".
ISPM-J-0257	Electrostatic, Electromagnetic and Magnetic Compatibility Requirements and Test Methods.
ISPM-J-0360	EMC and Energetic Radiation Environment.
ISPM-M-0350	ISPM Experiment System Level Integration and Test Requirements, Part A.
ISPM-DHB-0125	EXPCOE Requirements for the ISPM Project.
ISPM-P-0300	Environmental test Measurement and Inspection Requirements for ESA ISPM Instruments.

3. FUNCTIONAL DESCRIPTION

3.1 Primary Functions

The primary functions of the VHM are as follows:

a. To sense the components of the ambient magnetic vector along three mutually orthogonal axes.

b. To provide filtered analog voltages representing the three field components to the HED 01 data processing subsystem for digitization.

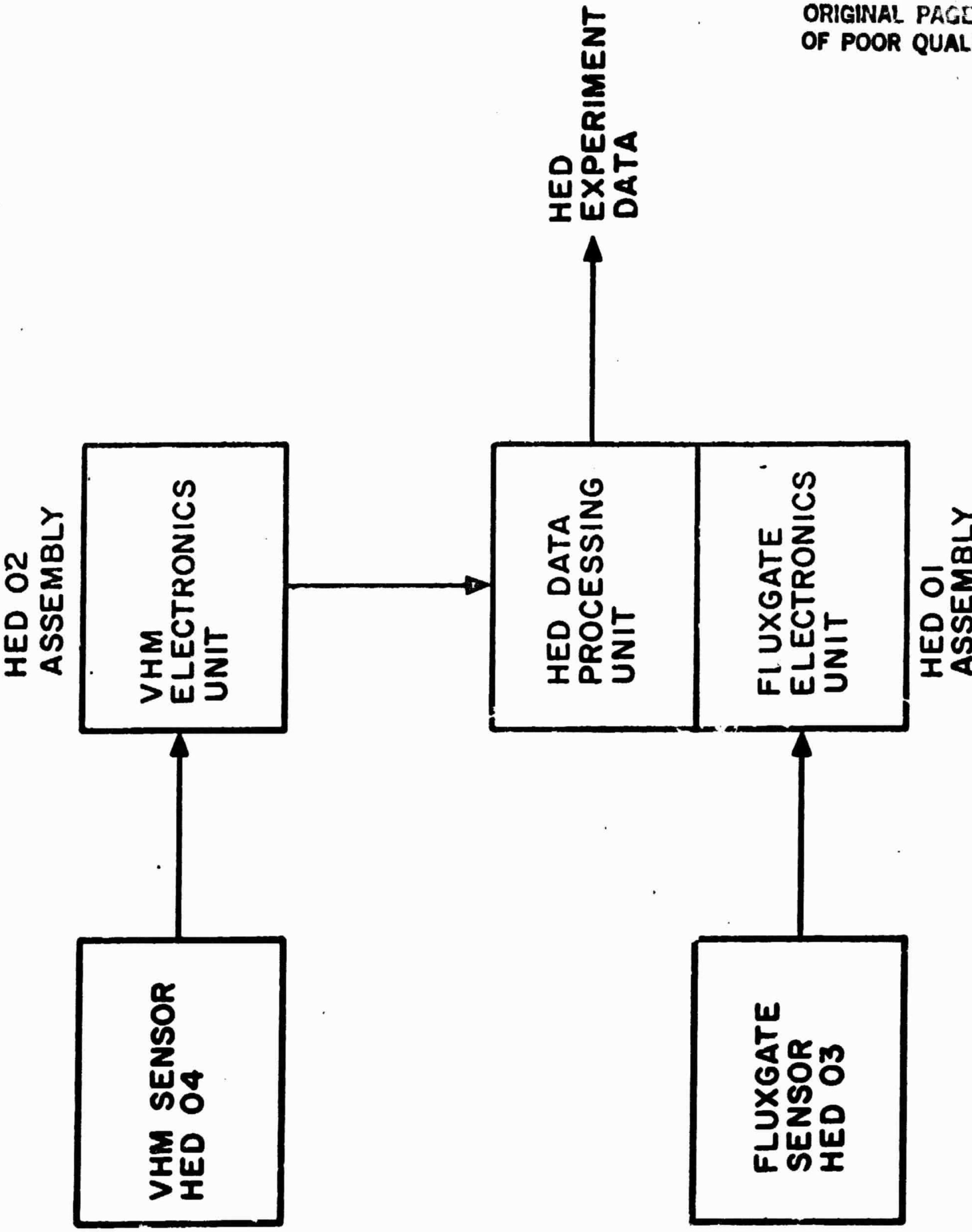


Figure 1. Hedgecock Experiment Assemblies

c. To operate on one of two dynamic ranges selected either automatically or by ground command.

d. To calibrate the VHM sensor in flight upon ground command by imposing known magnetic fields.

e. To provide VHM analog housekeeping and digital operating status indications to the HED 01 data processing subsystem.

f. To control the VHM sensor temperature in flight.

3.2 System Description

3.2.1 General

A simplified block diagram of the VHM is shown in Figure 2a. The system consists of two major functional elements: a sensor package mounted at the end of a spacecraft boom and connected by means of a ~7-meter harness to a main electronics package located within the spacecraft main body. The VHM main electronics consists of five major subsystems: 1) the servo electronics; 2) the digital timing, control and status electronics 3) the sensor lamp and cell RF supplies and ignition generator; 4) the temperature monitor and control electronics, and 5) the low voltage power supply. Figure 2b is a more detailed block diagram of the VHM instrument.

3.3 Subsystem Descriptions

3.3.1 Boom Package

The boom package consists of: 1) the VHM sensor; 2) a thermal isolator and boom attachment fitting; 3) a heater and thermal blanket for thermal control; 4) and a short cable with connectors for electrical connection to the boom cable.

3.3.1.1 Sensor Description

Figure 3 is a schematic diagram of the VHM sensor. The sensor utilizes field-dependent light absorption (the Zeeman effect and optical pumping), to sense the magnetic field. Helium in an absorption cell is excited by an electrodeless radio frequency (RF) discharge to maintain a population of metastable atoms. Light in the helium lamp is also generated by RF excitation. It is circularly polarized by a polarizer and passes through the cell to an infrared (IR) detector. When no magnetic field is present, the net

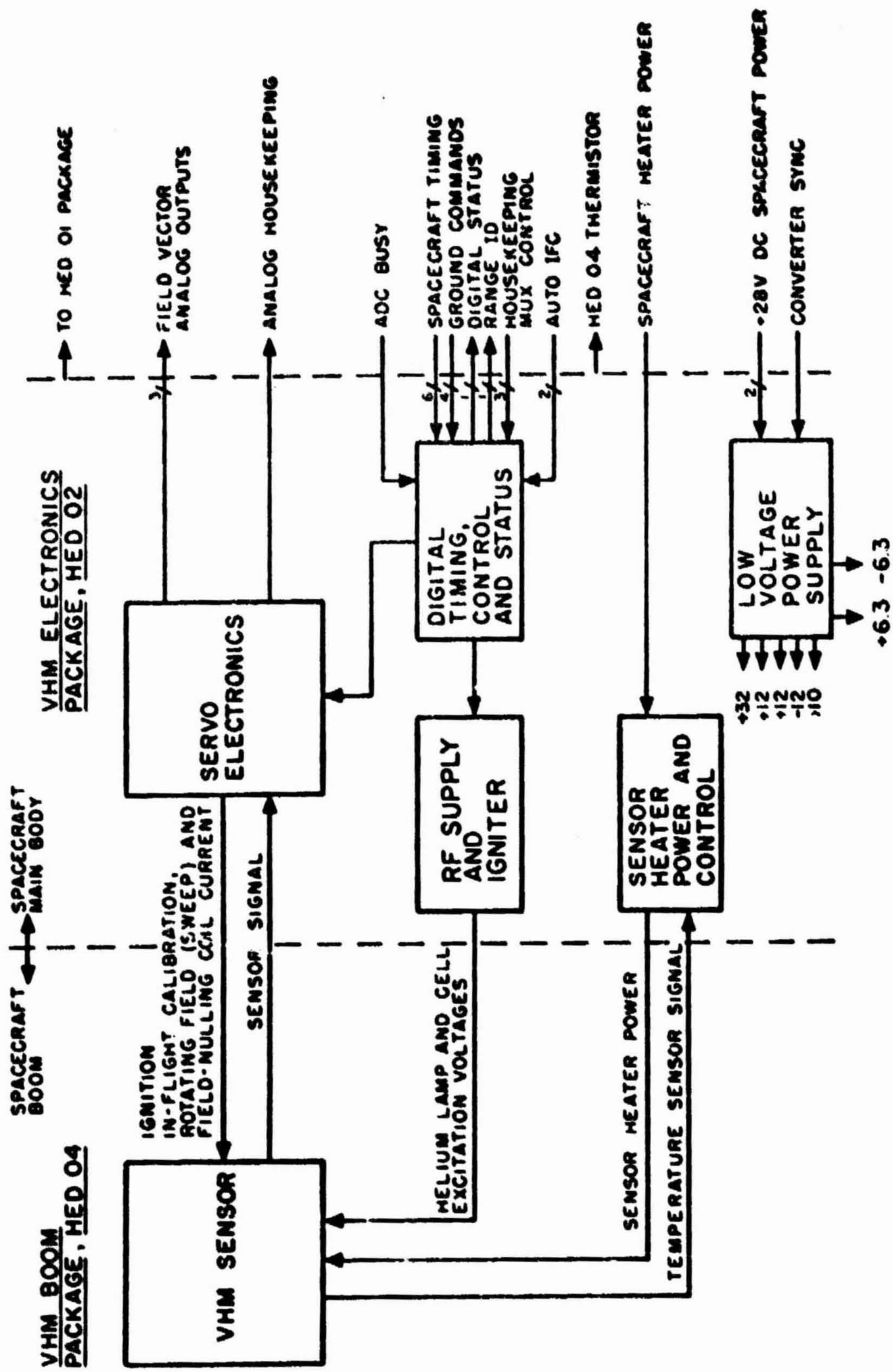
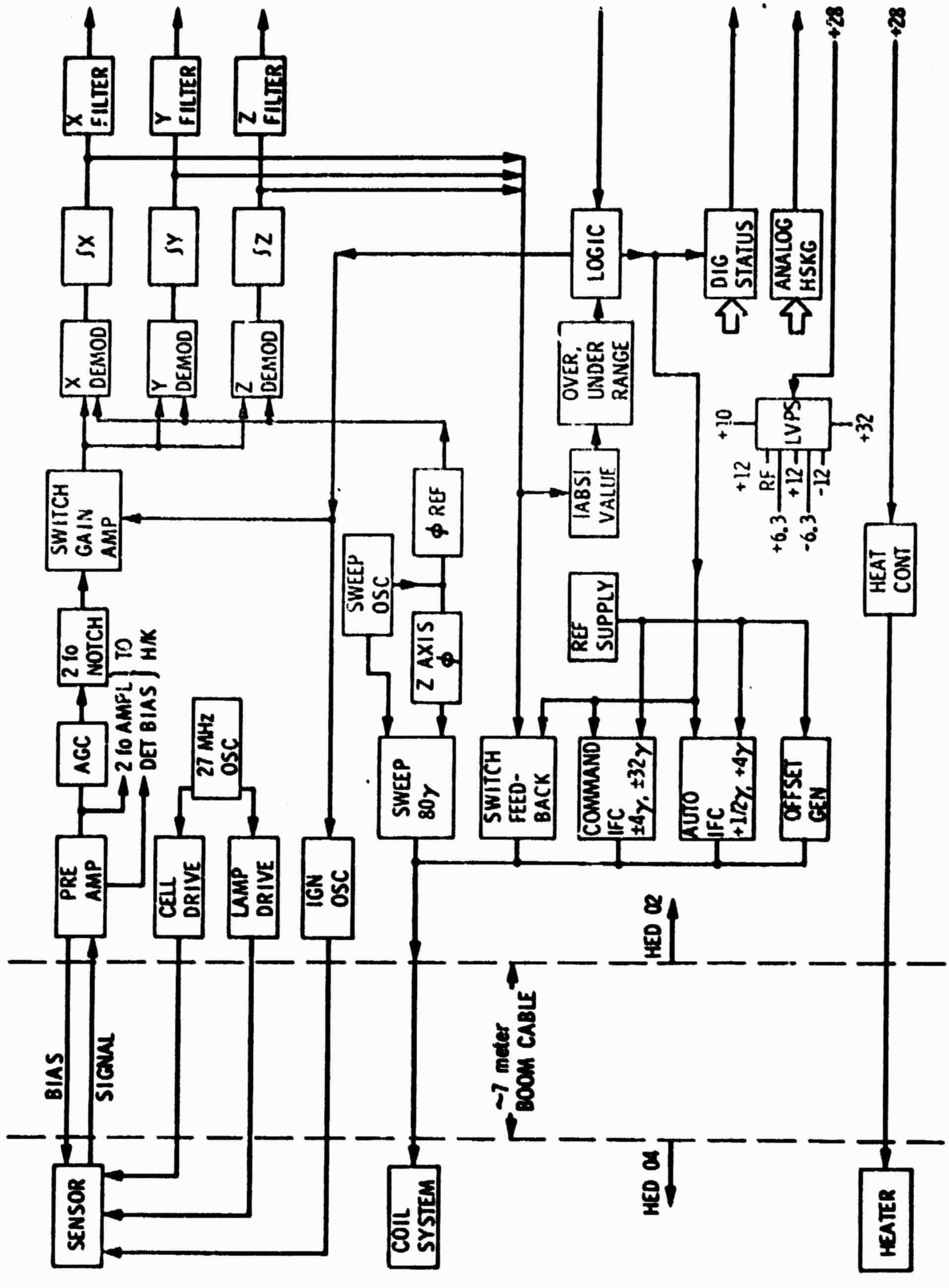


FIGURE 2a. VHM Simplified Block Diagram


X FILTER
Y FILTER
Z FILTER
∫X
∫Y
∫Z
X DEMOD
Y DEMOD
Z DEMOD
SWITCH GAIN AMP
2 fo NOTCH
TO H/K
AGC
2 fo AMPL
DET BIAS
PRE AMP
27 MHz OSC
CELL DRIVE
LAMP DRIVE
IGN OSC
SWEEP OSC
φ REF
Z AXIS φ
SWEEP 80γ
LOGIC
OVER, UNDER RANGE
|ABS| VALUE
REF SUPPLY
SWITCH FEED-BACK
COMMAND IFC ±4γ, ±32γ
AUTO IFC +1/2γ, +4γ
OFFSET GEN
DIG STATUS
ANALOG HSKG
LVPS
+10
+32
+12
RF
+12
-12
+6.3
-6.3
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HEAT CONT
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HED 02
HED 04
SENSOR
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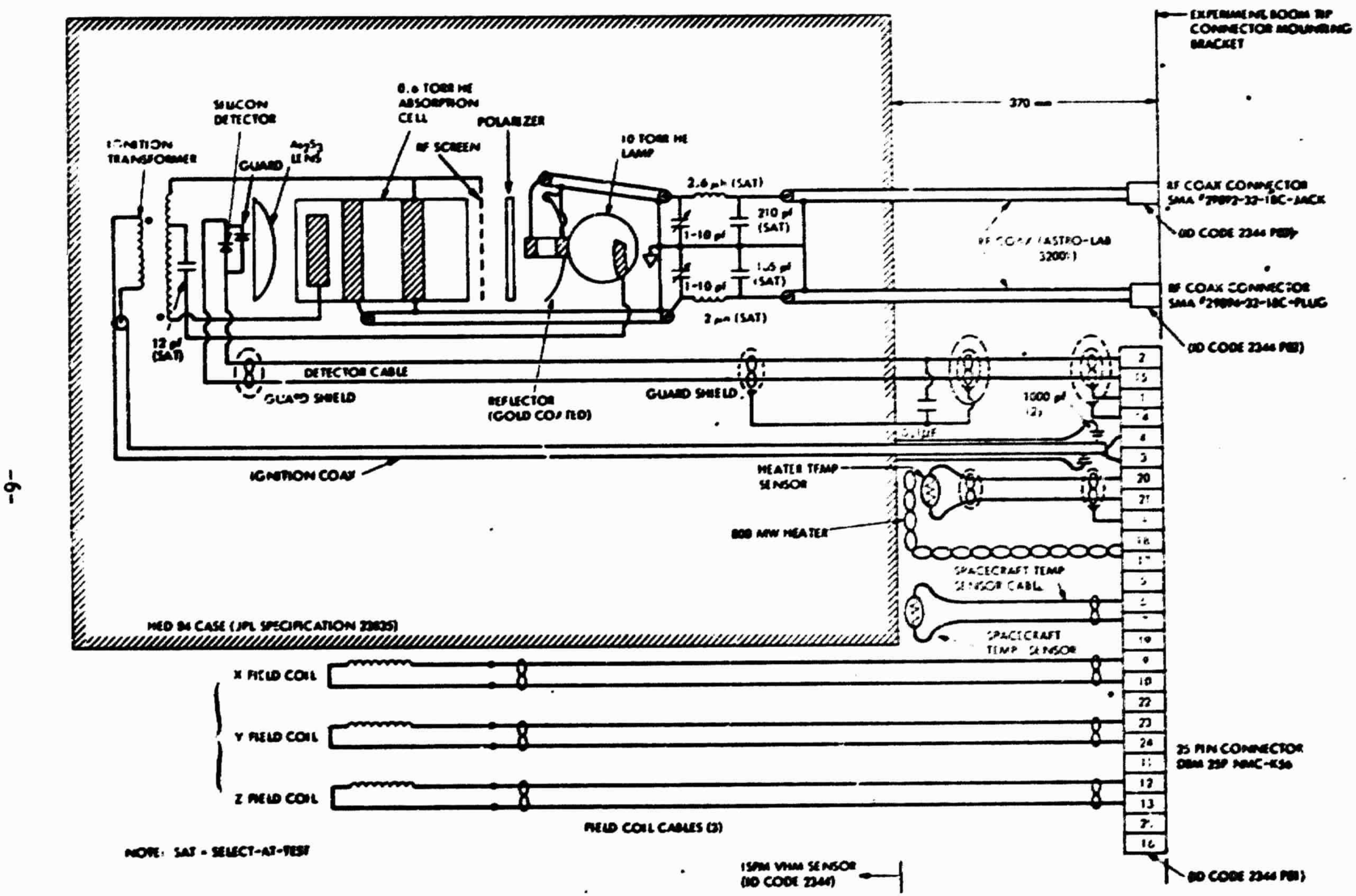

Figure 3. Schematic Diagram, VHM Sensor

optical pumping in the cell is zero. However, the presence of a field having a component transverse to the optical axis causes optical pumping to take place which can be sensed by the detector.

In the VHM, absorption in the helium cell is modulated by a rotating, circular sweep field generated by quadrature sinusoidal currents passed through triaxial Helmholtz coils surrounding the absorption cell. The field sweeps around alternately in two orthogonal planes on a time shared basis. Each plane contains the optical axis. When the ambient field component in the plane of the rotating vector is zero, the IR detector output waveform is a pure second harmonic of the sweep frequency. However, when a comparatively small and steady ambient field is present, the IR detector output also contains a fundamental frequency component (i.e., the first harmonic) that has a magnitude and phase which are dependent on the magnitude and direction of the magnetic field. In the time-sharing mode, the detector output contains sufficient information to derive the three field vector components unambiguously. These gated signals are synchronously demodulated in the electronics assembly where currents are fed back to the triaxial coils in a sense which tends to oppose the ambient field. Sufficient loop gain is provided to null the steady field imposed on the cell to a very small magnitude. The three axial output voltages of the basic instrument are derived from the feedback currents.

In-flight calibration fields are generated by imposing on the sensor coils currents of known amplitude and frequency.

3.3.1.2 Sensor Response Functions

The IR detector current ($i_{X,Y,Z}$) modulation at the sweep frequency is related to the ambient field components ($H_{X,Y,Z}$) by the following relations:

$$i_{X,Y} = H_{X,Y} \left(\frac{K_1}{H_o}\right) \left[\frac{S(4 + S^2)}{(1 + S^2)^2}\right] \sin \omega t,$$

$$i_Z = H_z \left(\frac{K_1}{H_o}\right) \left[\frac{S^3}{(1 + S^2)^2}\right] \cos \omega t,$$

where K_i and H_o are constants, S = H sweep/H_o and ω is the radian sweep frequency. The signal also contains a large second harmonic term $i_{2fo} = K_i \frac{S^2}{1+S^2} \cos 2\omega t$, which is not field dependent.

3.3.1.3 Sensor Mounting Attachment

The mounting attachment provides a means for attaching the VHM sensor to the boom, for orienting the sensor axes relative to the spacecraft axes and for controlling the heat flow across the boom/sensor interface during flight. The sensor is end-mounted to the boom such that these attachment provisions become an integral part of the thermal barrier at the boom interface.

3.3.1.4 Thermal Elements

A VHM sensor heater, control resistor and spacecraft readout thermistor will be mounted within the sensor housing. A thermal radiating area, painted for the required emission property, will be located near the inboard end of the sensor. All components of the VHM boom package except the thermal radiating area and pigtail harness are to be enclosed by the sensor's multi-layer thermal blanket. The pigtail will be enclosed in a separate wrap of its own.

3.3.1.5 Electrical Connection

A short "pigtail" cable with end-connectors provides the electrical connection of the VHM to a boom-mounted cable leading to the VHM electronics package (HED 02) that is located within the main body of the spacecraft. The connection is by way of boom root connectors at the base of the experiment boom.

3.3.2 Electronics Package

3.3.2.1 Servo Electronics

Figure 4 is a functional block diagram of the servo electronics. This subsystem converts the IR detector current modulation to an amplified voltage signal, suppresses the second harmonic, separates the axial phase components and converts them to D.C. by phase-synchronous demodulation. Three D.C. amplifier/integrators provide further gain/loop-bandwidth control for the X, Y and Z axes. These amplifiers drive negative feedback currents through calibrated resistors to the X, Y and Z sensor coils so that the ambient field

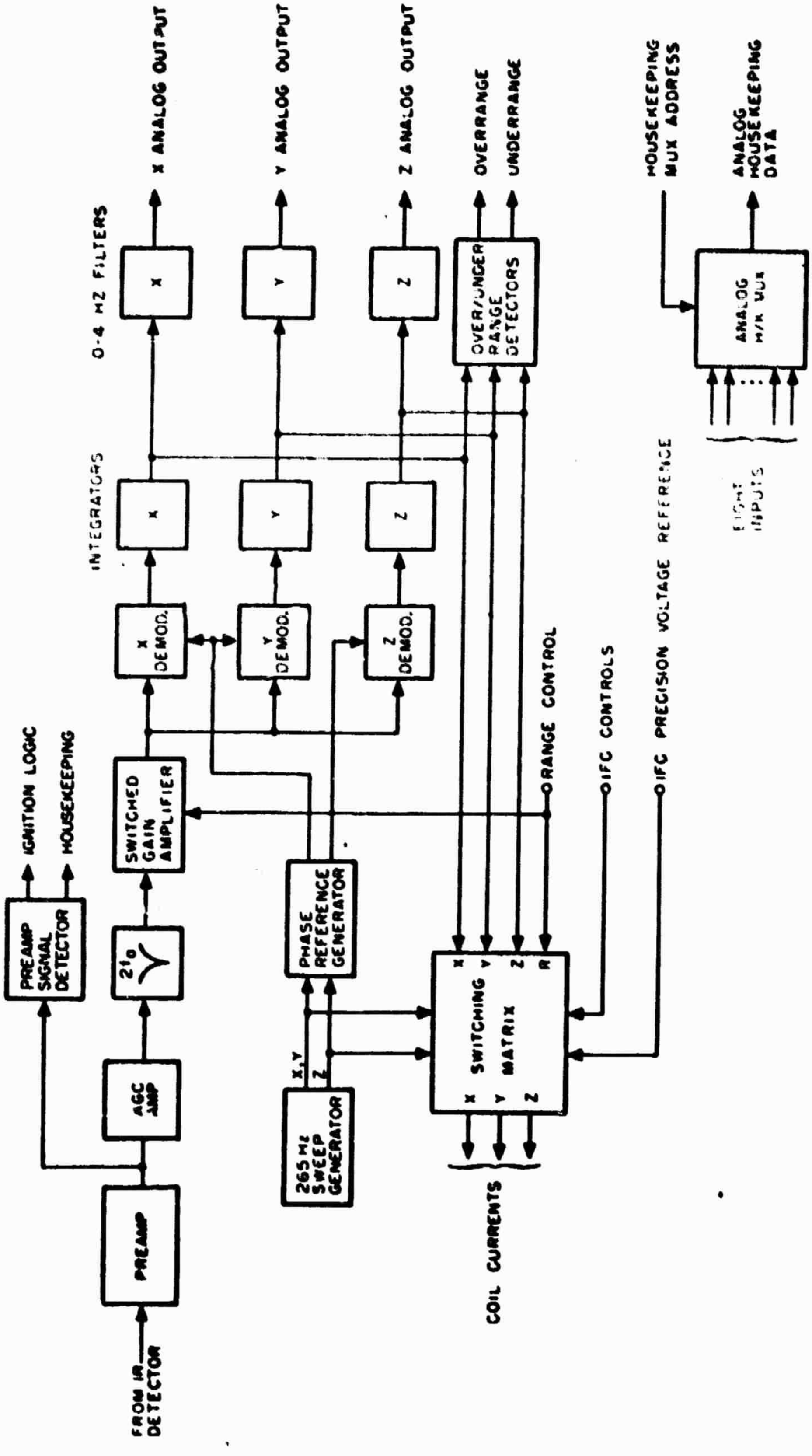

Figure 4. Functional Diagram, VHM Servo Electronics

is nulled. The voltages across the feedback resistors represent the three ambient magnetic field components being measured. These voltages are filtered by three low-pass filters before they are passed to the HED-01 package for digital conversion and processing. In addition, the servo electronics performs the following functions:

a. Generates sweep currents for the sensor coils.

b. Generates adjustable phase references for the demodulators.

c. Generates preamplifier output and signal status indicator.

d. Generates precision currents fed to the sensor coils for in-flight calibration (IFC).

e. Detects over and under range conditions and provides indications to the control logic for automatic ranging.

f. Provides range switches to control the sweep field, IFC, and nulling (i.e., feedback) currents.

g. Controls the servo loop gain according to the operating range by means of a switched gain amplifier.

h. Detects, scales and multiplexes eight analog housekeeping voltages onto one output line. The parameter on the output line will be selected by a 3-bit address from the HED 01 electronics. (These address lines must be buffered, and the multiplexer output clamped at +6 VDC, and -1 VDC as well as protected against external short circuits by a 2200 ohm series resistor.) The eight parameters to be multiplexed are: 1) VHM preamplifier signal level, 2) IR detector bias current, 3) lamp RF amplitude, 4) cell RF amplitude, 5) Heater voltage, 6) reference voltage, 7) ±12 VDC supply, and 8) ±6.3 VDC supply.

The servo electronics performance parameters are given in Table 1.

3.3.2.2 Digital Timing, Control and Status Electronics

A functional block diagram of this subsystem is shown in Figure 5 and performance requirements are listed in Table 2. The functions of the subsystem are as follows:

a. To provide range switching commands to the loop electronics. At any given time, all three axes are always operated on the

Table 1. Servo Electronics Performance Parameters

Dynamic Ranges:	Range	Full Scale Gamma
	0	$\pm$ 8.190
	1	$\pm$ 65.52
K_i		$0.58 \pm 0.08 \times 10^{-6}$ amperes rms
H_o		32 $\pm$ 5 gammas
Field-equivalent servo electronics noise		3.6 mγ rms/$\sqrt{HZ}$
Peak sweep amplitude		60 + 10, -6 gamma (both ranges) settable to within 2 gamma
X and Y axis coil constant		1.765 $\pm$ 0.025 μa/γ
Z axis coil constant		1.642 $\pm$ 0.025 μa/γ
Sweep amplitude stability		$\pm$ 1%
Nominal sweep frequency		265 $\pm$ 1 HZ
Sweep frequency stability:		
Over operating temperature		$\pm$ 1 HZ, or better
Over 66 K Rad (S_i) radiation environment		$\pm$ 4 HZ, or better
Z Axis sweep phase (w.r.t. X & Y)		90° adjustable $\pm$ 15° to a precision of 0.°6.
Demodulator phase references		Adjustable from 0° to 40° phase lag, with respect to the reference generator each axis, setable to a precision of 0.°6.
Maximum crosstalk		$\leq$ 0.°2 @ f < 0.1 HZ, $\leq$ 1° @ f = 4 $\pm$ 0.1 HZ between any two axes.
Loop bandwidth		0 to 12 HZ (+ 3 Hz, -2 HZ)
Loop phase margin		> 45°
Allowable change in phase shift		$\leq$ 0.°1 at the nominal S/C spin frequency (1/12 sec) over nominal operating temperature range and variations in nominal sensor scale factors.

Table 1. Servo Electronics Performance Parameters (Cont'd)

Output filter full scale voltage, all ranges, all axes		± 5.11875 ± 0.01 volts
Scale factors at filter output:	Range 0	1.60 gamma/volt
	Range 1	12.80 gamma/volt
Output scale factor setability		Setable to a precision of 0.4% of nominal value, each range.
Output scale factor stability		± 0.3%
Scale factor linearity		Linear to within 0.1% of full scale.
D.C. offset, each axis		Less than + 2.5 gamma, settable to less than 1% of full-scale, stable to within 0.2% of full scale.
Overrange threshold (preceding output filter)		± 5.00 (± 0.07) volts at any one wideband output; X, Y or Z.
Underrange threshold (preceding output filter)		± 0.51 (± 0.07) volts at all three wideband outputs; X, Y and Z.
Output filter characteristic		0 to 4 ± 0.1 HZ (noise bandwidth) 3-pole Butterworth.
Maximum output noise:		7 $m\gamma/\sqrt{HZ}$ rms @ 1 HZ

In flight calibration, (IFC)

Commandable: 2 levels, (± 48.84% of full scale, i.e. +4γ and -4γ or +32γ and -32γ) on the range presently in use (or the next higher one) while in the automatic ranging mode. (Note: In the automatic ranging mode, either range 0 IFC level could in principle cause the instrument to up range).

2 levels, (± 48.84% of full scale), only on the range selected by ground command while in the manual ranging mode. (Note: In the manual ranging mode, either IFC level could in principle cause the instrument to saturate).

Note: The commandable IFC is to be a self terminating sequence with a duration of one format time per level applied, (i.e. 32 or 64 seconds for each of the two levels depending upon the prevailing data rate).

Table 1. Servo Electronics Performance Parameters (Cont'd)

Automatic:	1 level, (+6.105% of full scale, i.e., +0.5γ or +4.0γ) applied repetitively at a 50% duty cycle. It is to be initiated and terminated by the Automatic IFC ON/OFF control signal from the HED 01 package and operated by the Automatic IFC Gate input also from the HED 01 package. (The auto IFC gate will be a 0 to 10 VDC, 2 HZ square wave that is at half the Nyquist frequency and is format-synchronous. The auto IFC control signal will be +10 VDC ON and OVDC OFF).
IFC Settability:	Each level settable to ±1% of the required level.
IFC Stability:	Stable to within 0.3% of each level.
Analog housekeeping multiplexer:	
Address lines:	3-bit BCD code that changes once per format. '1' = +10VDC, '0' = OVDC.
Output line:	0 to 5.10 VDC with clamping at -1VDC and +6VDC and 2200 ohm in-series protection.
	The multiplexer steps assignments, the nominal voltages, alarm limits and conversion to engineering units are shown on the following table.

Table 1. Servo Electronics Performance Parameters (Cont'd)

Word 62, Frame 25, (HED D4) Bit Number			H/K MUX Step Number, Octal	Word 61, Frame 10, (HED A1) HED 02/04 Housekeeping Parameter Description	Nominal Output, Volts	Alarm Limits, Volts		Conversion to Engineering Units	Resulting Units	Resulting Range	
4	3	2				Low	High			Low	High
0	0	0	0	VHM Preamplifier Output	$V_0 = 1.70$	1.36	2.04	$V_{PREAMP} = 0.210\ V_0$	Volts RMS	0.286	0.428
0	0	1	1	IR Detector Bias Current	$V_1 = 3.80$	3.00	4.60	$I_{DETECTOR} = 72.8\ V_1$	Microamps DC	218	335
0	1	0	2	Helium Lamp RF Amplitude	$V_2 = 3.42$	3.07	3.77	$V_{LAMP} = 0.373 + 1.519\ V_2$	Volts RMS	5.04	6.10
0	1	1	3	Helium Cell RF Amplitude	$V_3 = 2.75$	2.50	3.00	$V_{CELL} = 0.407 + 0.727\ V_3$	Volts RMS	2.22	2.58
1	0	0	4	Heater Current Monitor	$V_4 = 2.50$	0.00*	5.00	$I_{HEATER} = 7.14\ V_4$	Milliamps DC	0.00	35.7
1	0	1	5	±3.75 VDC Reference	$V_5 = 2.50$	2.38	2.63	$V_{\pm 3.75} = 1.50\ V_5$	Volts DC	±3.57	±3.95
1	1	0	6	±12 VDC Supply	$V_6 = 2.67$	2.54	2.80	$V_{\pm 12} = 4.484\ V_6$	Volts DC	±11.39	±12.56
1	1	1	7	±6.3 VDC Supply	$V_7 = 2.56$	2.31	2.82	$V_{\pm 6.3} = 2.456\ V_7$	Volts DC	±5.67	±6.93

NOTE:

*Normal ground-test value of HED 04 heater current monitor is 0.00 volts even when raw heater power is on.

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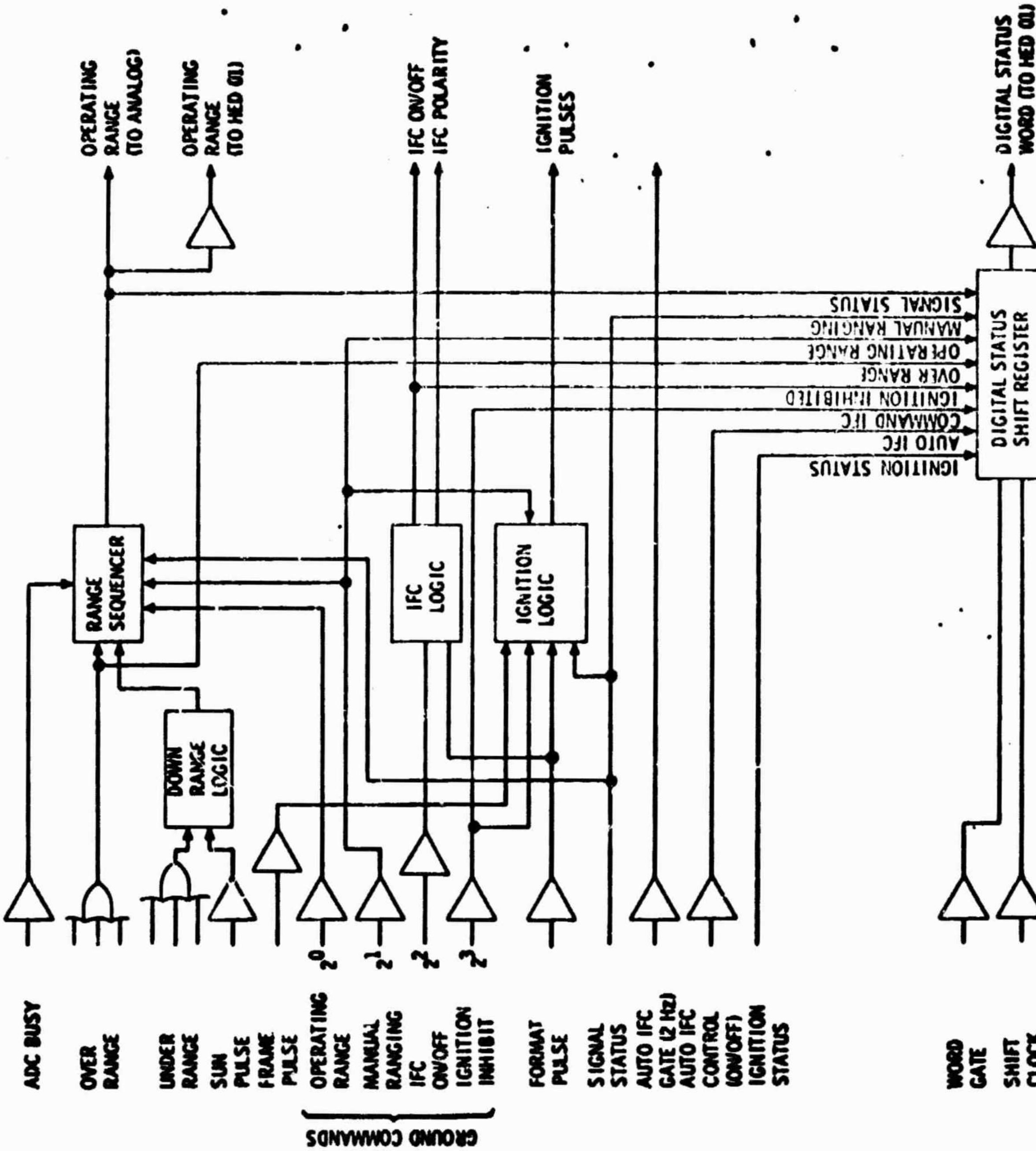

Figure 5. Functional Diagram, Digital Timing, Control and Status Electronics

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Table 2. Timing, Control and Status Logic Parameters

COMMANDS:

Bit Code: 2^3 2^2 2^1 2^0	VHM Instrument State
0 0 0 0	Ignition ENABLED, IFC OFF, Automatic ranging
0 0 1 0	" " , " " , Manual range 0
0 0 1 1	" " , " " , Manual range 1
0 1 0 0	" " , IFC ON, Automatic ranging
0 1 1 0	" " , " " , Manual range 0
0 1 1 1	" " , " " , Manual range 1
1 0 0 0	Ignition INHIBITED, IFC OFF, Automatic ranging
1 0 1 0	" " , " " , Manual range 0
1 0 1 1	" " , " " , Manual range 1
1 1 0 0	" " , IFC ON, Automatic ranging
1 1 1 0	" " , " " , Manual range 0
1 1 1 1	" " , " " , Manual range 1

AUTO uprange time delay	Instantaneously except when inhibited by ADC busy.
AUTO downrange time delay	Greater than one spacecraft rotation (i.e., > 12 seconds nominally)
Ignition time delay	At power on: Second occuring format pulse following power-on reset. After a signal loss: Next occuring format pulse.
Ignition command width	1 second
Preamplifier "signal loss" threshold	30 to 50 millivolts
Range identification output	1 bit, (Range # Δ BCD #)
Housekeeping multiplixer address	3 bits, (000 through 111 sequentially)
ADC busy	Range-change inhibit (+10VDC ON, CV OFF, approximately 3 ms ON, 122 ms OFF)

Table 2. Timing, Control and Status Logic Parameters (Cont'd)

AUTO IFC Gate	Bi-level signal at 2 HZ ($f_{nyquist}/2$) that operates the automatic IFC sequence.
AUTO IFC Control	Bi-level control signal that initiates and terminates the automatic IFC sequence.
Digital Status Word:	
2^7	VHM sensor signal status (signal present = '1', signal lost = '0')
2^6	VHM operating mode (Auto ranging = '0' Manual ranging = '1')
2^5	VHM operating range
2^4	Over range indicator
2^3	Ignition gate status (ENABLED = '0' INHIBITED = '1')
2^2	Commandable IFC status (OFF = '0', ON = '1') (Note 1)
2^1	Automatic IFC (OFF = '0', ON = '1')
2^0	Ignition voltage status (OFF = '0', ON = '1')

same range. In the manual ranging mode, the range is determined by the least significant ground command bit. In the automatic mode, the range is controlled by the over and under range indicators from the servo electronics subsystem. Up-ranging will occur when any of the loop (i.e., wideband) outputs exceeds the over range threshold. Down-ranging will occur when all three loop (i.e., wideband) outputs fall below the under range threshold and remain there for at least one spacecraft revolution (≈ 12 sec.). VHM range changes are to be inhibited whenever an analog-to-digital converter (ADC) busy signal is present at the HED 02-to-HED 01 interface connector (typically for 3 milliseconds out of every 125 milliseconds).

b. Provide IFC switching commands to the loop electronics for the commandable IFC sequence. The commandable IFC sequence is to be initiated with a format pulse and to be self-terminating, lasting two format periods. The commandable IFC is to operate both in the automatic ranging mode and in the manual ranging mode. In either mode, each of two levels will be applied to all three axes at the same time and the sequence will then be terminated. The first level will be either +4 or +32 gamma, and the second level will be either -4 or -32 gamma for Ranges 0 and 1 respectively.

c. Provide IFC switching commands to the loop electronics for the automatic IFC sequence which is both initiated and terminated by the automatic IFC control signal from the HED 01 assembly, and operated by the auto IFC gate signal from the same source.

d. Provide ignition pulses to the RF generator/ignition circuit. The ignition pulse is used to dump charge from storage capacitors into an oscillator circuit that drives an ignition transformer located in the VHM sensor. The ignition pulse will be generated on the next format pulse following the time when the signal at the preamplifier output in the loop electronics falls below a set threshold. In the automatic ranging

mode, whenever signal loss is detected, the range will be automatically set to range 1.

e. Temporarily store VHM digital operating status data and shift it out serially when a word gate and shift pulses are received from the HED 01 electronics. The functions to be indicated are: 1) sensor signal status (preamp signal present or signal lost), 2) VHM ranging mode (manual/auto); 3) VHM operating range (1 bit), 4) overrange indicator (1 bit), 5) ignition gate status (enabled or inhibited), 6) commandable IFC status (on/off); 7) automatic IFC status (on/off), 8) VHM sensor ignition voltage (on/off). Note: The word gate and shift pulse inputs and the digital status word output are all to be buffered.

f. Provide one bit of buffered data indicating the instrument operating range for use by the HED 01 electronics in tagging each digitized VHM output vector.

g. Buffer and decode the four ground command lines for the purpose of establishing the VHM operating state. The default (i.e., '0000') operating state is AUTO ranging, IFC OFF, ignition ENABLED.

h. Perform power-on reset functions at the time +28 VDC spacecraft power is applied to the VHM. The instrument operation immediately following power ON is to be automatic ranging mode, range 1, IFC OFF, ignition ENABLED. The first ignition pulse will occur after a time delay long enough for the ESA Project's turn-on transient requirement to be met and when the ignition capacitors have stored sufficient charge to light the helium lamp and cell.

3.3.2.3 <u>RF and Ignition Supply Electronics</u>

The ~27 MHz radio frequency and ignition supply consists of a single crystal-controlled oscillator, two buffered power output stages to furnish sustaining power for the sensor lamp and cell, and a separate stored-charge

ignition circuit. The ignition circuit discharges a capacitor voltage into an oscillator circuit that drives the primary of an ignition transformer located in the VHM sensor housing. Separate taps on secondary windings carry high voltage to ignition electrodes on the lamp and cell for the purpose of igniting the glow discharges. Ignition is initiated by a signal from the timing and control logic. Each of the ~27 MHz output stages will be matched to a coaxial cable of 50 ± 3 ohms characteristic impedance. The required lamp power at the output of the driver stage is 650 mw. Output power from the cell driver stage is required to be 150 mw. The required voltage stability of both outputs is ± 1%.

3.3.2.4 Sensor Heater Power and Control Electronics

This subsystem generates and controls heater power being sent to a heater located in the boom package for control of the VHM sensor temperature. A temperature control resistor in the boom package is used to determine the magnitude of current carried to the heater element via the boom cable. The combined maximum power allocated for both the sensor heater and its controller is one watt. A proportional DC controller is envisioned with a set point temperature between 0°C and +10°C, settable to within 1°C.

3.3.2.5 Low Voltage Power Supply

Spacecraft raw power at + 28 volts D.C. will be supplied to the low voltage power converter which generates the required supply voltages for the VHM electronics. The converter shall be designed to operate at 57344 Hz, in synchronism with the 114688 Hz power sync signal. Moreover, the free running (unsynchronized) operating frequency of the converter shall be greater than 52,000 Hz. D. C. supply voltages required are:

Analog electronics	± 12 V
Digital electronics	+ 10 V
Lamp RF power	+ 12 V
Cell RF power	+ 12 V
Ignition supply	+ 32 V
Analog switches	± 6.3 V

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4. INTERFACE DEFINITION

4.1 Mechanical Interfaces

The mechanical interfaces of the boom package and the electronics package are represented by the mounting provisions shown in Figures 6 and 7.

4.2 Thermal Interfaces

The sensor boom package will be exposed to solar radiation throughout the mission. Approximately 630 milliwatts of RF power will be dissipated by the lamp and cell within the sensor housing. In addition, a feedback-controlled electrical heater will be mounted near the inboard end of the case adjacent to the sensor attach fitting and thermal barrier. Both the sensor case and attach fitting will be enclosed by a multilayer thermal blanket. The principal paths for heat losses from the VHM sensor are thought to be by conduction through the mechanical interface and boom cable, and by radiation to deep space. Thermal control of the electronics package will be effected primarily by conduction through the mechanical interface to the spacecraft main experiment shelf.

4.3 Electrical Interfaces

The electrical connections are shown in Figure 8.

The electrical interfaces between the VHM electronics (HED 02) and the VHM boom package (HED 04) are given in Table 3. The HED 02-to-HED 01 interface is described in Table 4. The VHM test connector interface is given in Table 5. VHM electrical interfaces are also illustrated in Figure 9. Figure 10 shows the grounding scheme.

5. PERFORMANCE

The Solar Polar VHM is to be designed for a minimum lifetime of 5 1/4 years, including 4 years of prime mission operation after exposure to the Jovian trapped radiation environment. The primary VHM performance parameters are summarized in Table 6.

6. PHYSICAL CHARACTERISTICS

The primary physical characteristic requirements of the Solar Polar VHM are shown in Table 7.

7. SENSOR ALIGNMENT REQUIREMENTS

Figure 11 shows the required alignment of the sensor axes relative to the spacecraft principal axes. The required alignment tolerance is ± 1/2° maximum error with knowledge to within 1/4°.

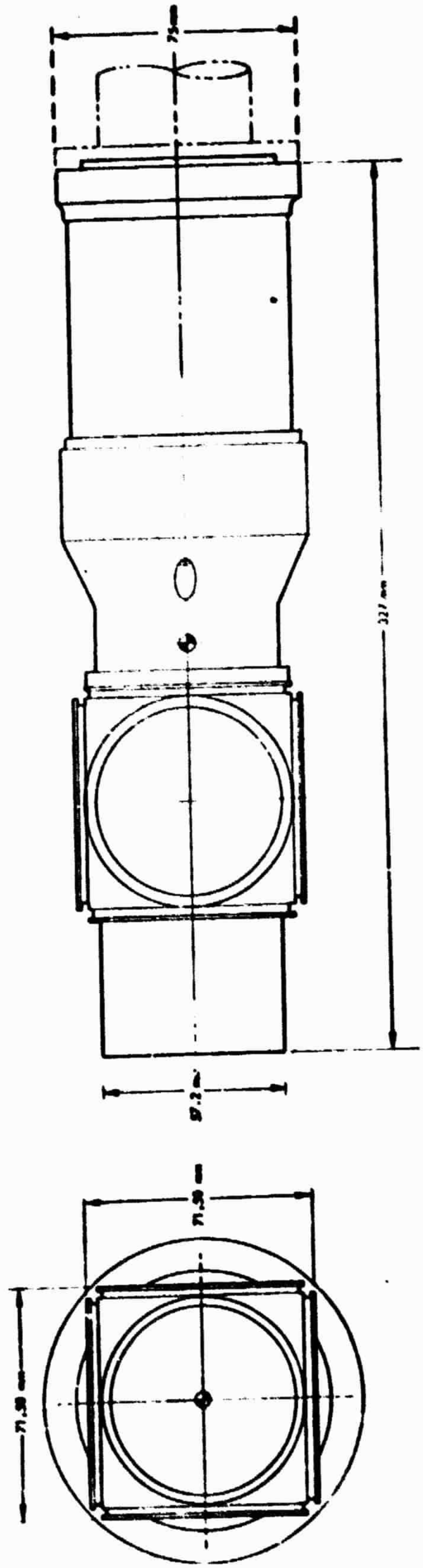
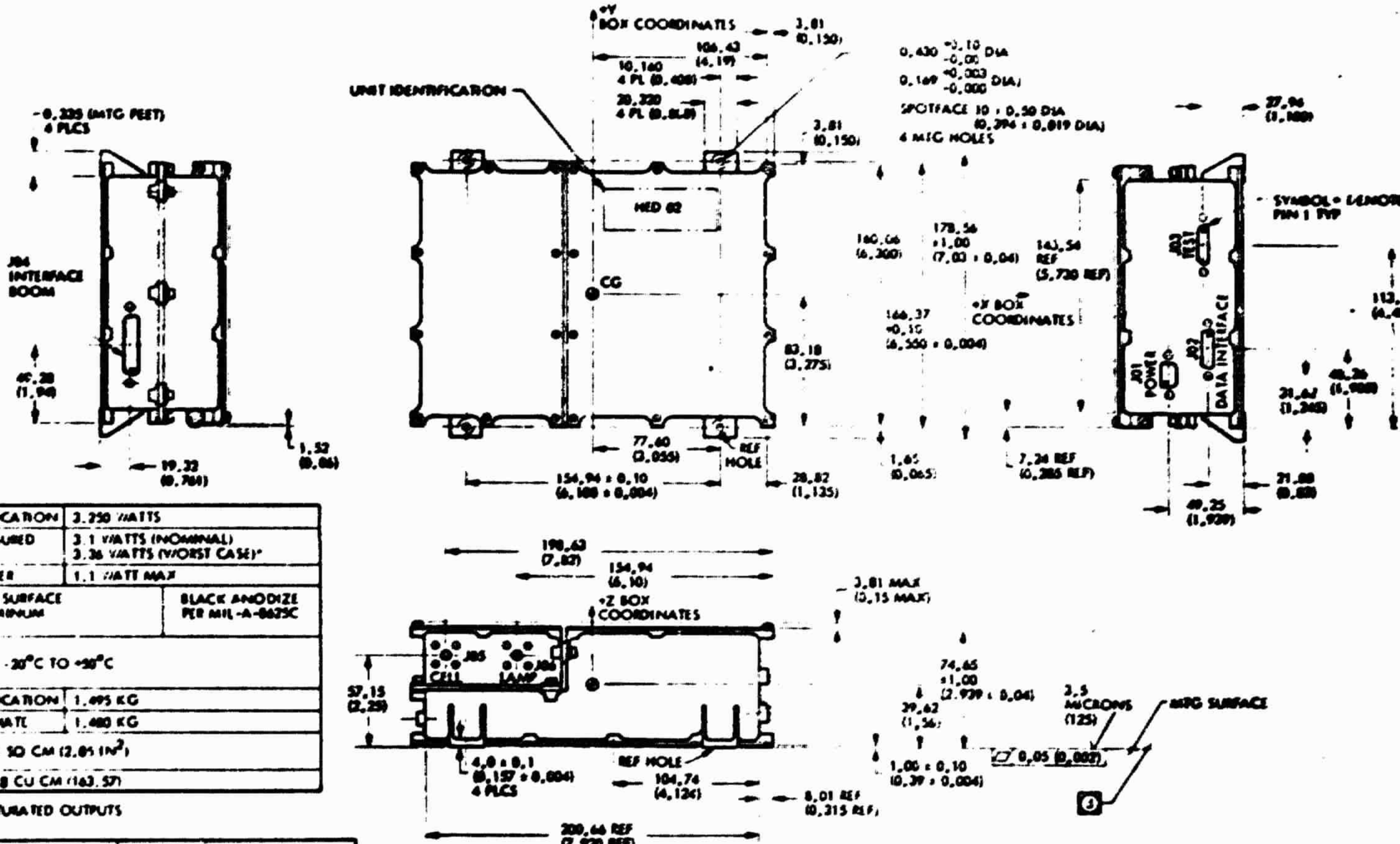


Figure 6. VHM Sensor (HED 04 Assembly) Mounted on Boom



POWER	ALLOCATION	3.250 WATTS
	MEASURED	3.1 WATTS (NOMINAL) 3.36 WATTS (WORST CASE)*
	HEATER	1.1 WATT MAX
SURFACE FINISH	MTG SURFACE ALUMINUM	BLACK ANODIZE PER MIL-A-8625C
OPERATING TEMPERATURE RANGE	-20°C TO +50°C	
INSTRUMENT WEIGHT	ALLOCATION	1.495 KG
	ESTIMATE	1.480 KG
MOUNTING SURFACE	13.21 SQ CM (2.05 IN^2)	
VOLUME	2680.8 CU CM (163.57)	

*50°C WITH SATURATED OUTPUTS

DESIGNATION	CONNECTOR	MFG	FUNCTION
HED 02 J01	DEM-9P-NMC-K56	CANNON	EXPERIMENT POWER
HED 02 J02	MDM-51PH001B-A141	↓	DATA INTERFACE
HED 02 J03	MDM-37PBBP-A141	↓	TEST
HED 02 J04	DBM-25S-NMC-K58	CANNON	BOOM INTERFACE
HED 02 J05	SMA (298068C)	ASTROLAB	CELL RF DRIVER
HED 02 J06	SMA (298058C)	ASTROLAB	LAMP RF DRIVER

NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS SHOWN IN PARENTHESIS ARE IN INCHES
2. TOLERANCES: .XXX = 0.250 MM (0.010) .XX = 0.50 MM (0.02)
3. THESE SURFACES TO BE BARE ALUMINUM

Figure 7. VHM Electronics Assembly (HED 02)

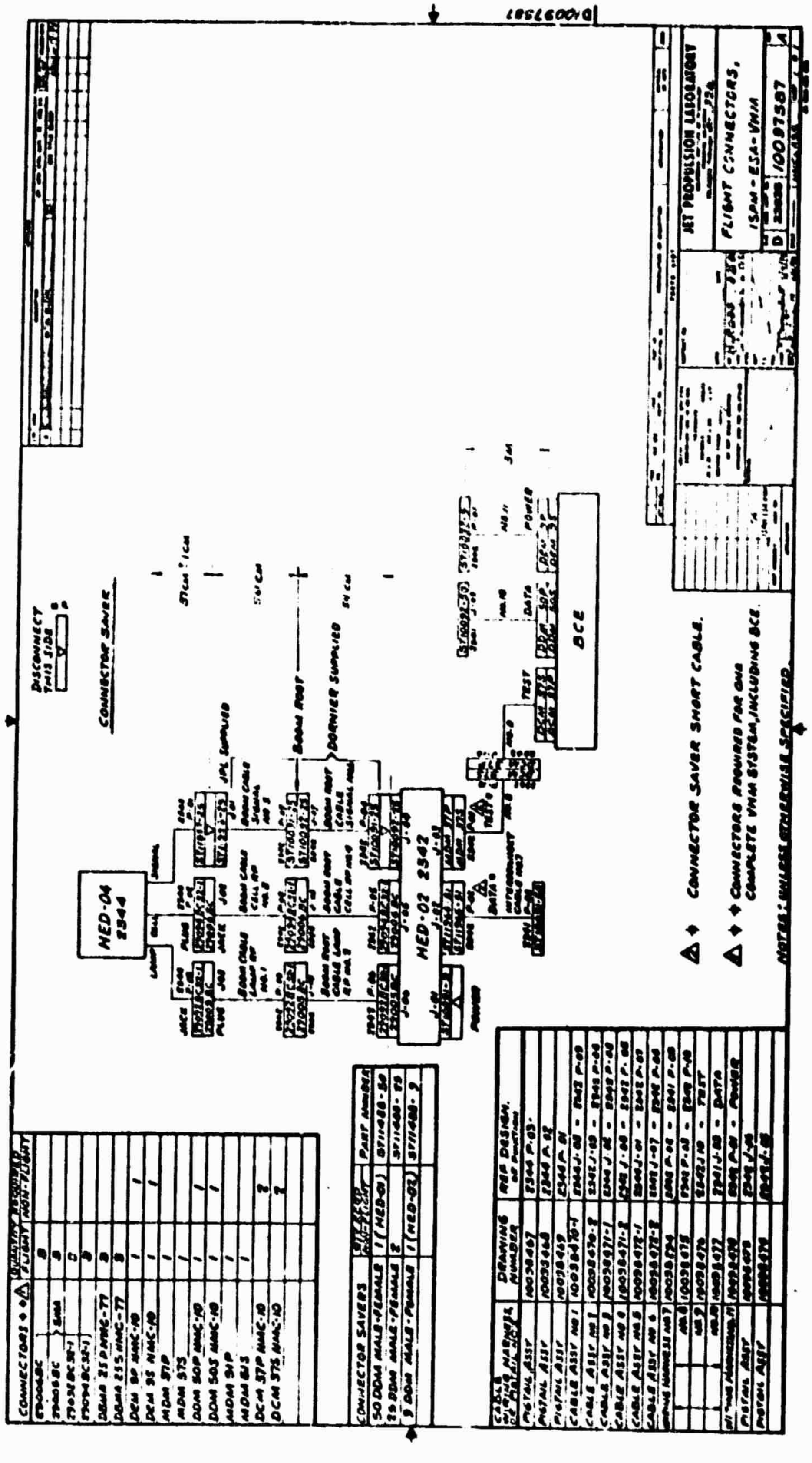


Figure 8. VHM Electrical Connections

Table 3. HED 02 to HED 04 Boom Harness Interface, P04

PIN	FUNCTION
1	Guard
2	VHM sensor IR detector bias
3	Igniter return
4	Igniter
5	Shield (analog ground, G4)
6	VHM sensor thermistor 1 (S/C readout)
7	VHM sensor thermistor 1 return
8	Shield (analog ground, G4)
9	X axis sweep drive
10	X axis sweep return
11	Shield (analog ground, G4)
12	Z axis sweep drive
13	Z axis sweep return
14	Shield (analog ground, G4)
15	VHM sensor IR detector output
16	Spare
17	VHM sensor heater return
18	VHM sensor heater
19	Shield (analog ground, G4)
20	VHM sensor thermistor 2 (temperature control)
21	VHM sensor thermistor 2 return
22	Shield (Analog ground, G4)
23	Y axis sweep drive
24	Y axis sweep return
25	Shield (analog ground, G4)

Table 4a. HED 02 to HED 01 Power Interface, J01

PIN	FUNCTION
3	+ 28 VDC spacecraft power
7	S/C power return and sync return G3
4	+ 28 VDC spacecraft power
8	S/C power return and sync return G3
9	Power converter sync
5	S/C power return and sync return G3
6	Heater power (+ 28 VDC)
1	Heater power return
2	Heater power (+ 28 VDC)

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Table 4b. Pin Assignments for HED 02, P03

(50 pin D series Interconnect Connector)

Pin	Assignment	Pin	Assignment	Pin	Assignment
17	HED D3 Status Word	33	Chassis	50	Chassis
16	HED D3 Status Word	32	Digital Return G5	49	Bit Shift Pulse
15	HED D3 W/G	31	Digital Return G5	48	Bit Shift Pulse
14	HED D3 W/G	30	Digital Return G5	47	ADC Busy
13	Frame Pulse	29	Auto IFC Control	46	ADC Busy
12	Frame Pulse	28	Auto IFC Control	45	Sun Pulse
11	Format Pulse	27	Auto IFC Gate	44	Sun Pulse
10	Format Pulse	26	Auto IFC Gate	43	2^2 Mux Address
9	2^3 Command	25	Operating Range	42	2^1 Mux Address
8	2^2 Command	24	Operating Range	41	2^0 Mux Address
7	2^1 Command	23	HED 04 Th Return	40	Analog H/K
6	2^0 Command	22	HED 04 Th Return	39	Analog H/K
5	HED 04 S/C Therm	21	Analog Return G4	38	Analog Return G4
4	HED 04 S/C Therm	20	Y Field Data	37	Z Field Data
3	Analog Return G4	19	Y Field Data	36	Z Field Data
2	X Field Data	18	Spare	35	Spare
1	X Field Data			34	Spare

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Table 4c. Pin Assignments for HED 02, P02

(51 Pin MDM Interconnect Connector)

Pin	Assignment	Pin	Assignment	Pin	Assignment
18	Spare	35	Spare	51	Chassis
17	HED D3 Status Word	34	Spare	50	Chassis
16	HED D3 Status Word	33	Chassis	49	Bit Shift Pulse
15	HED D3 Word Gate	32	Digital Return G5	48	Bit Shift Pulse
14	HED D3 Word Gate	31	Digital Return G5	47	ADC Busy
13	Frame Pulse	30	Digital Return G5	46	ADC Busy
12	Frame Pulse	29	Auto IFC Control	45	Sun Pulse
11	Format Pulse	28	Auto IFC Control	44	Sun Pulse
10	Format Pulse	27	Auto IFC Gate	43	2^2 Mux Address
9	2^3 Command	26	Auto IFC Gate	42	2^1 Mux Address
8	2^2 Command	25	Operating Range	41	2^0 Mux Address
7	2^1 Command	24	Operating Range	40	Analog Housekeeping
6	2^0 Command	23	HED 04 Therm. Return	39	Analog Housekeeping
5	HED 04 S/C Thermistor	22	HED 04 Therm. Return	38	Analog Return G4
4	HED 04 S/C Thermistor	21	Analog Return G4	37	Z Field Data
3	Analog Return G4	20	Y Field Data	36	Z Field Data
2	X Field Data	19	Y Field Data		
1	X Field Data				

Table 5. Pin Assignments for HED 02, J03

(37 Pin MDM Test Connector)

	Pin	Assignment		Pin	Assignment
	19	RF & Digital Ground, G5		37	Chassis (W/B Shield)
	18	Underrange Condition		36	Analog Ground, G4
11	17	Overrange Condition		35	Z Wideband test point
	16	VHM Operating Range		34	Y Wideband test point
	15	Auto IFC Control Status		33	X Wideband test point
	14	Commandable IFC Status		32	Chassis (Sweep Shield)
12	13	Ignition Charge Status		31	Analog Ground, G4
	12	Ignition Pulse	10	30	Z VHM Axis sweep voltage
	11	+32 VDC Igniter Supply	9	29	Y VHM Axis sweep voltage
7	10	+12 VDC RF Supply	8	28	X VHM Axis sweep voltage
	9	+10 VDC Digital Supply		27	Chassis (Monitor Shield)
	8	-12 VDC Analog Supply		26	Analog Ground, G4
	7	+12 VDC Analog Supply	3	25	Detector Current Monitor
	6	-6.3 VDC Switch Bias	2	24	Detector Voltage Monitor
	5	+6.3 VEC Switch Bias	4	23	Reference Voltage Monitor
	4	-3.75 VDC IFC Reference		22	Chassis (Preamp Shield)
	3	+3.75 VDC IFC Reference		21	Analog Ground, G4
5	2	Heater Voltage Monitor	1	20	Preamp Output
6	1	Analog Ground, G4			

NOTE:

Circles numbers represent assignments for 15 pin connector ON Thermal/Vacuum BCE.

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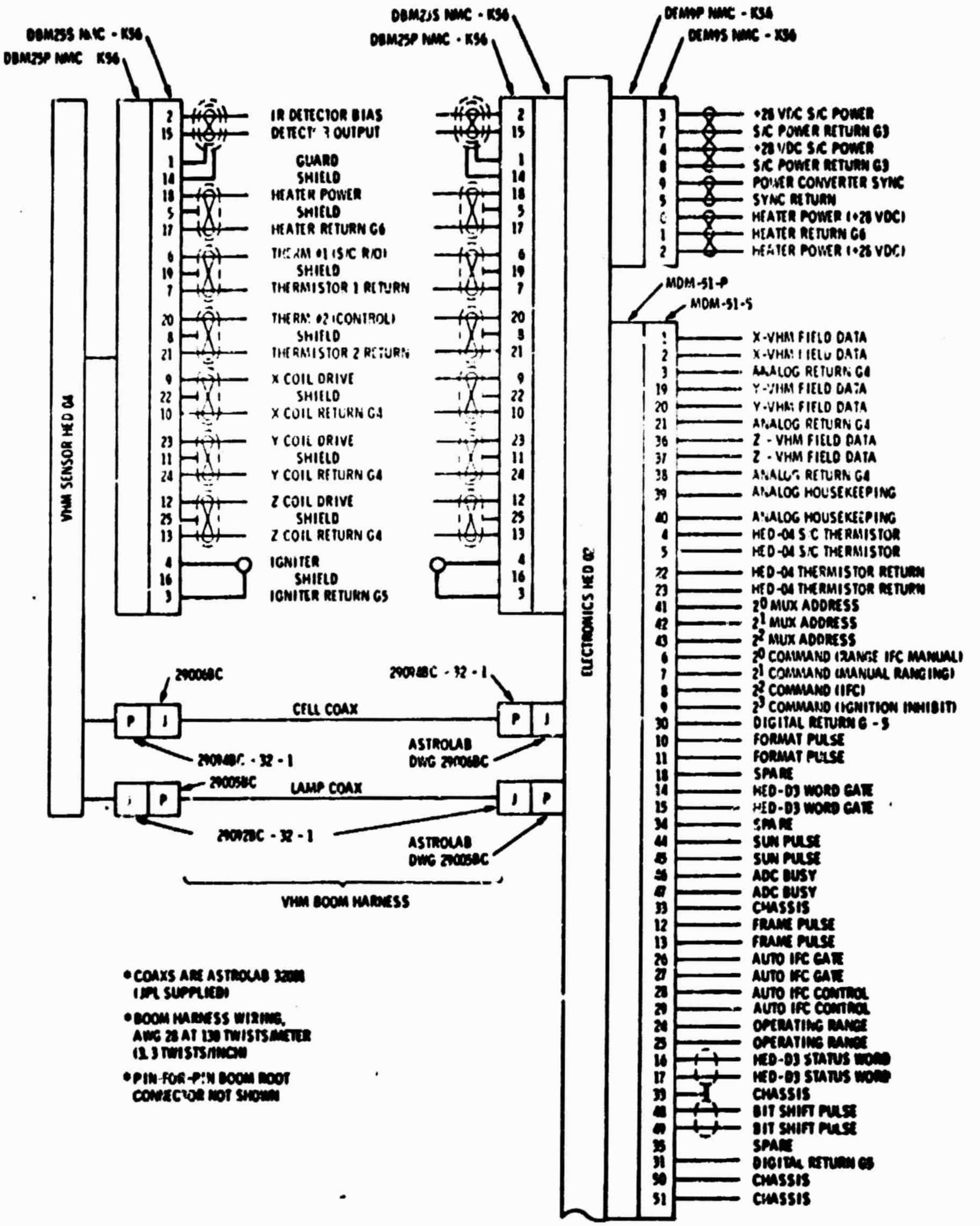

Figure 9. VHM Electrical Interface

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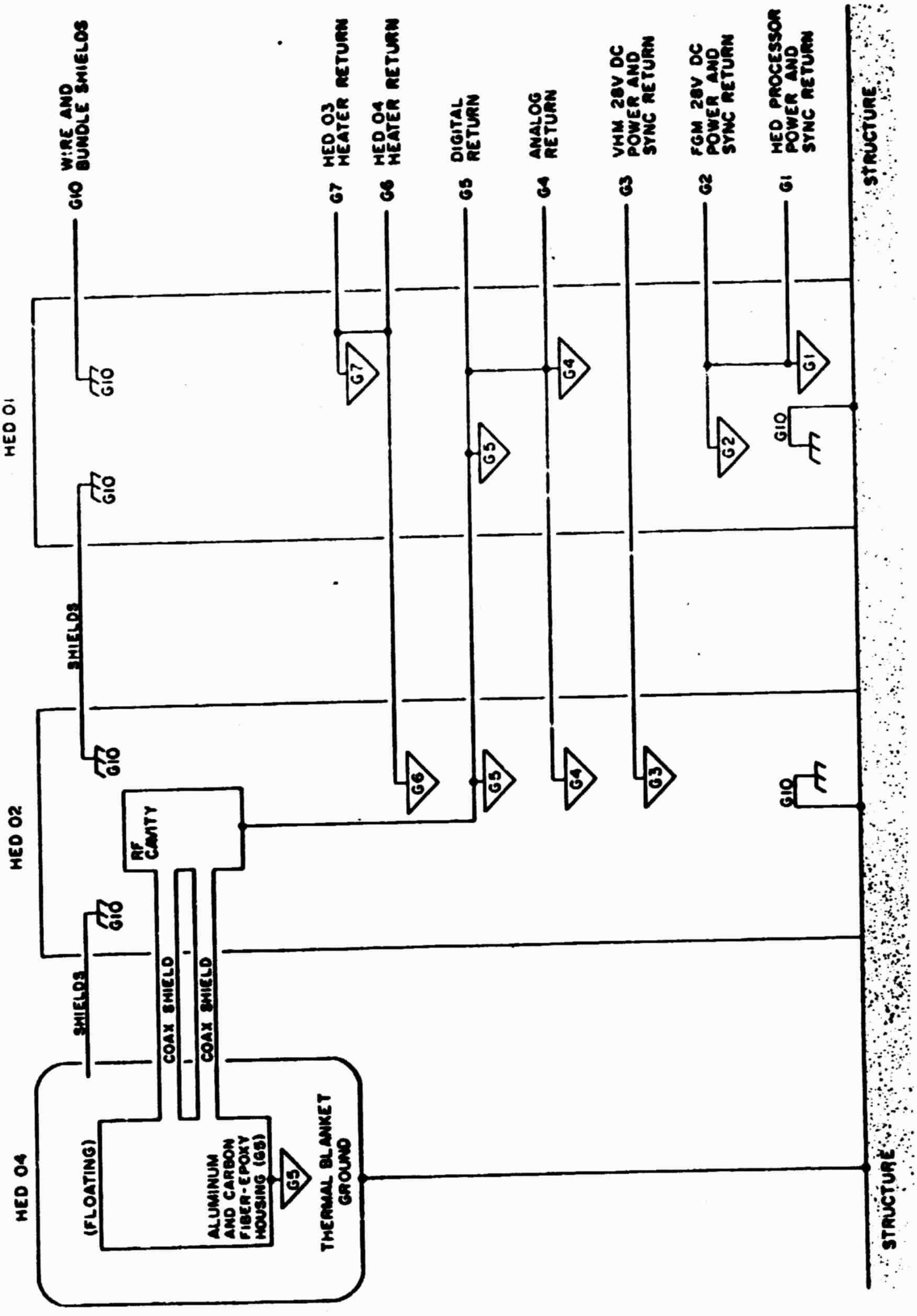


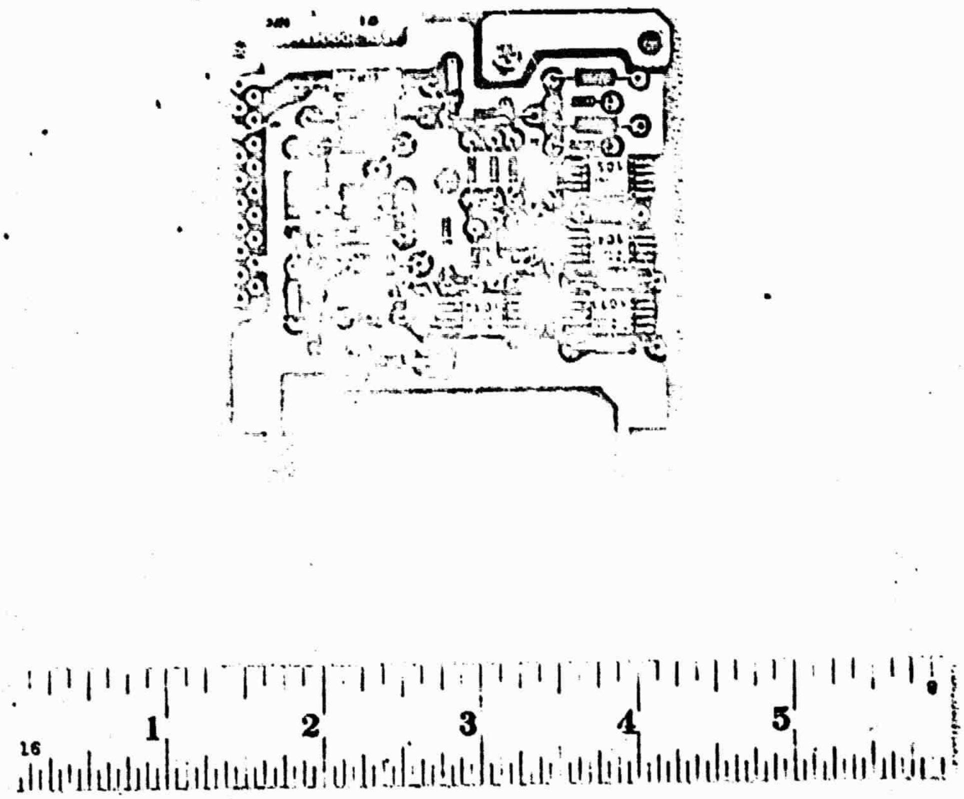
Figure 10. VHM Grounding Diagram

Table 6. Summary of the Primary VHM Performance Parameters

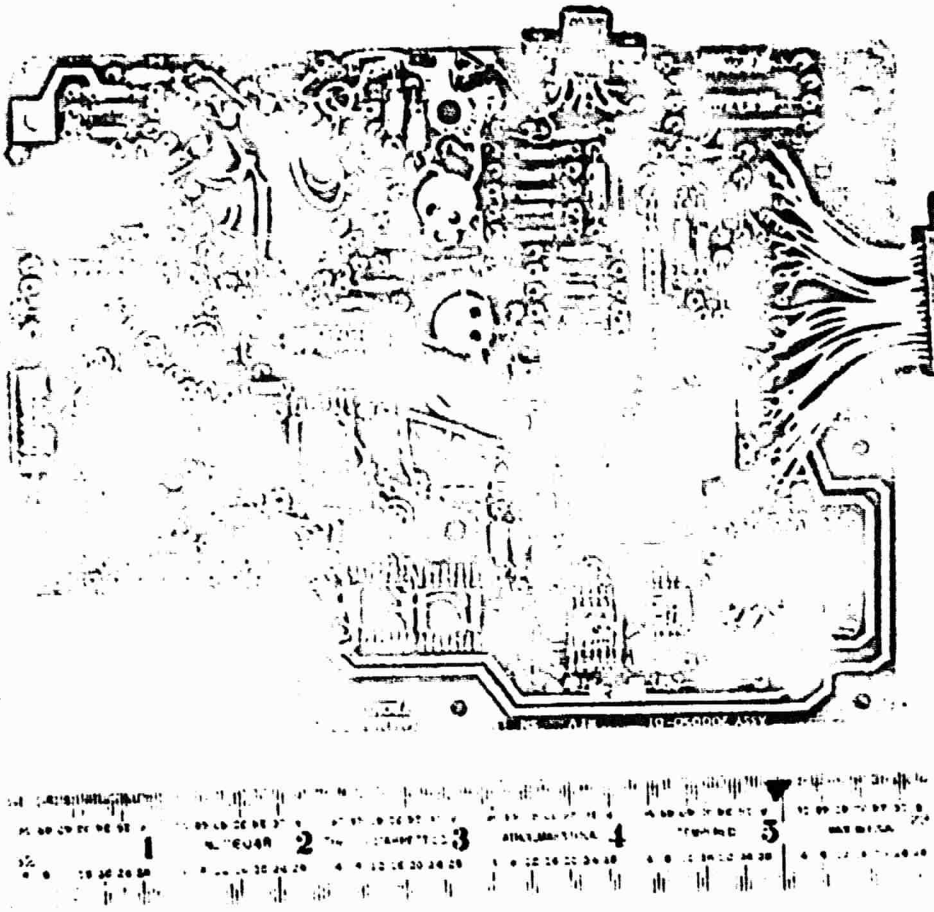
FUNCTION	PARAMETERS
Dynamic ranges	$\pm$ 8.190, $\pm$ 65.52, gammas full scale
Full scale output voltages:	
a) each analog field component	$\pm$ 5.12 $\pm$ 0.01 volts
b) analog housekeeping	0 to + 5.10 volts
Field-equivalent output noise	Less than 7 mγ rms/$\sqrt{HZ}$, (6mγ/$\sqrt{Hz}$ sensor, 3.6 mγ/$\sqrt{Hz}$ electronics)
Zero offset (each axis)	Adjustable to $\leq$ 1% of full scale
Stability	Scale factor stable to: $\pm$ 0.3% of full scale Zero offset stable to: $\pm$ 0.2% of full scale
Maximum interaxial crosstalk	$\leq$ 0.2 degree at < 0.1 HZ, $\leq$ 1.0 degree @ 4 HZ
Loop bandwidth	12^{+3}_{-2} Hz
Output filter bandwidth	0 to 4 $\pm$ 0.1 HZ effective noise bandwidth
Sensor response constants	K_i = 0.58 $\pm$ .08x10^{-6} amperes rms H_o = 32 $\pm$ 5 gammas

SECTION 2

Photographs of the Instrument

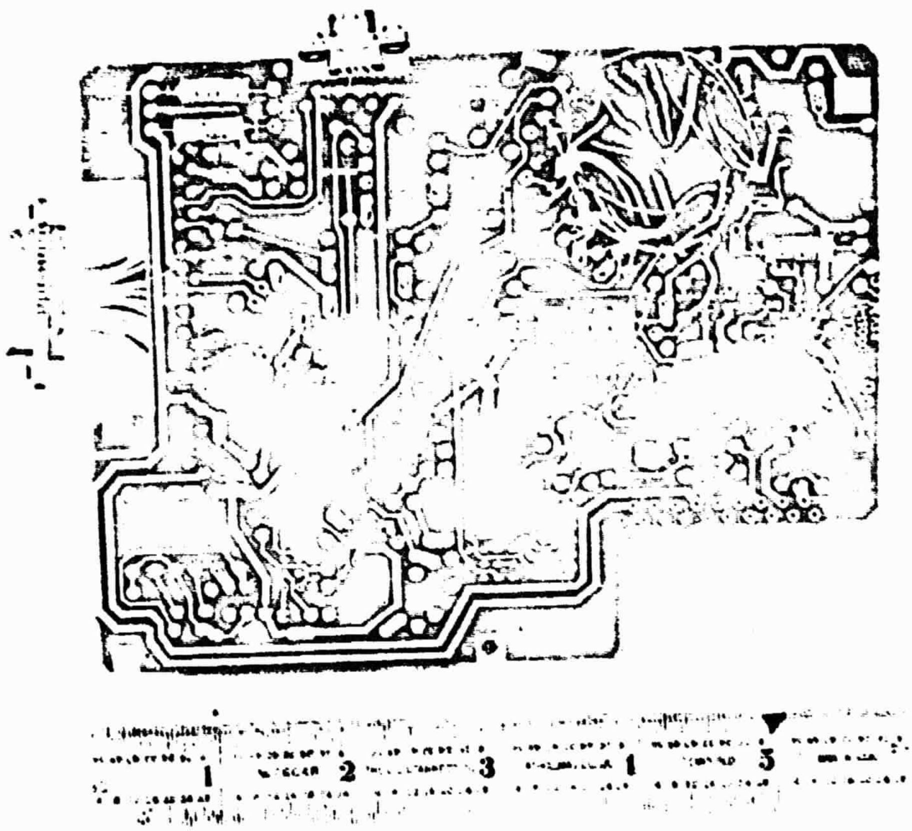


HEATER PWB ASSEMBLY - 200043



LOW VOLTAGE POWER SUPPLY

PWB ASSEMBLY - 200050



LOW VOLTAGE POWER SUPPLY

PWB ASSEMBLY (BACK SIDE) - 200050

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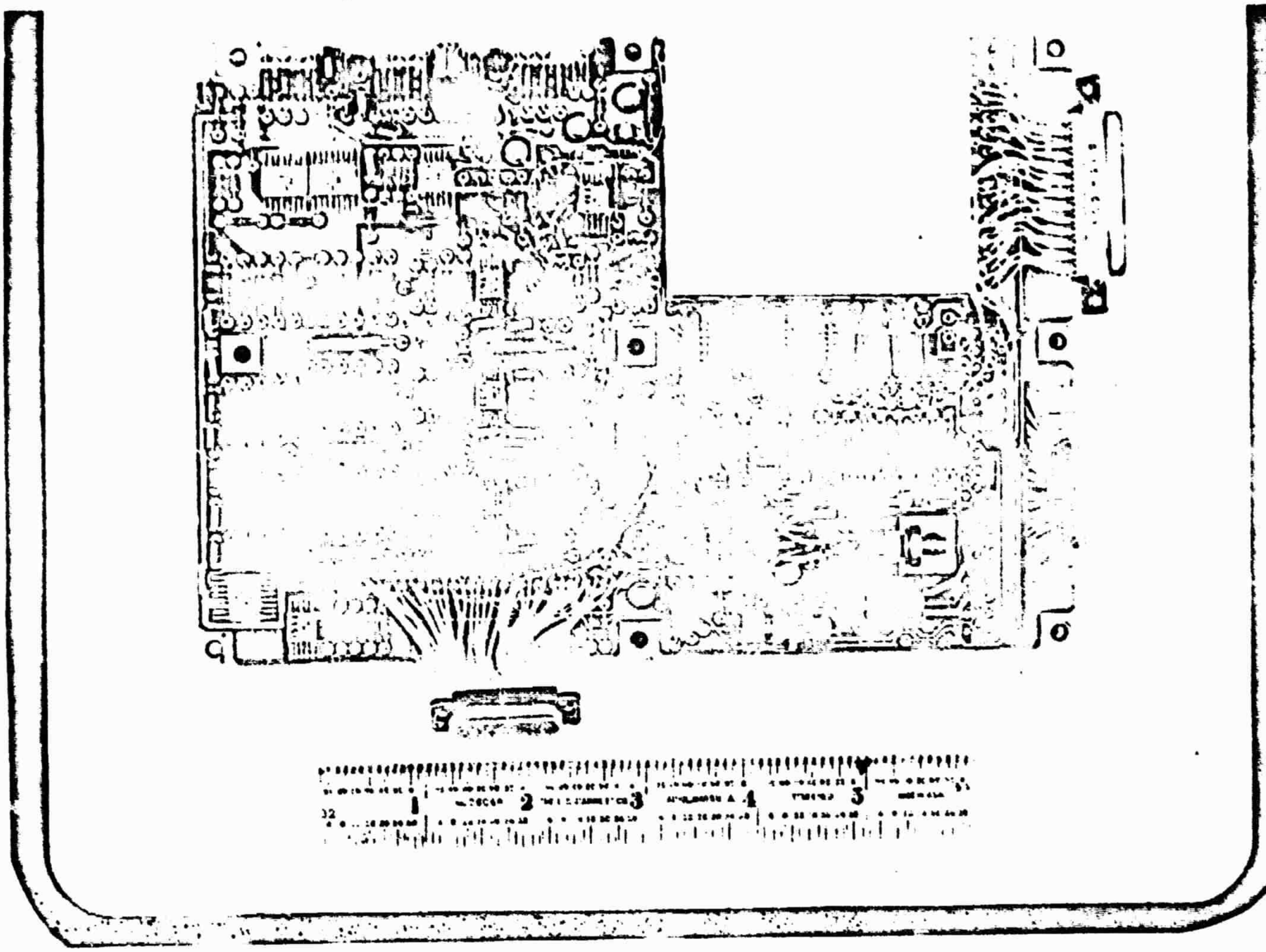
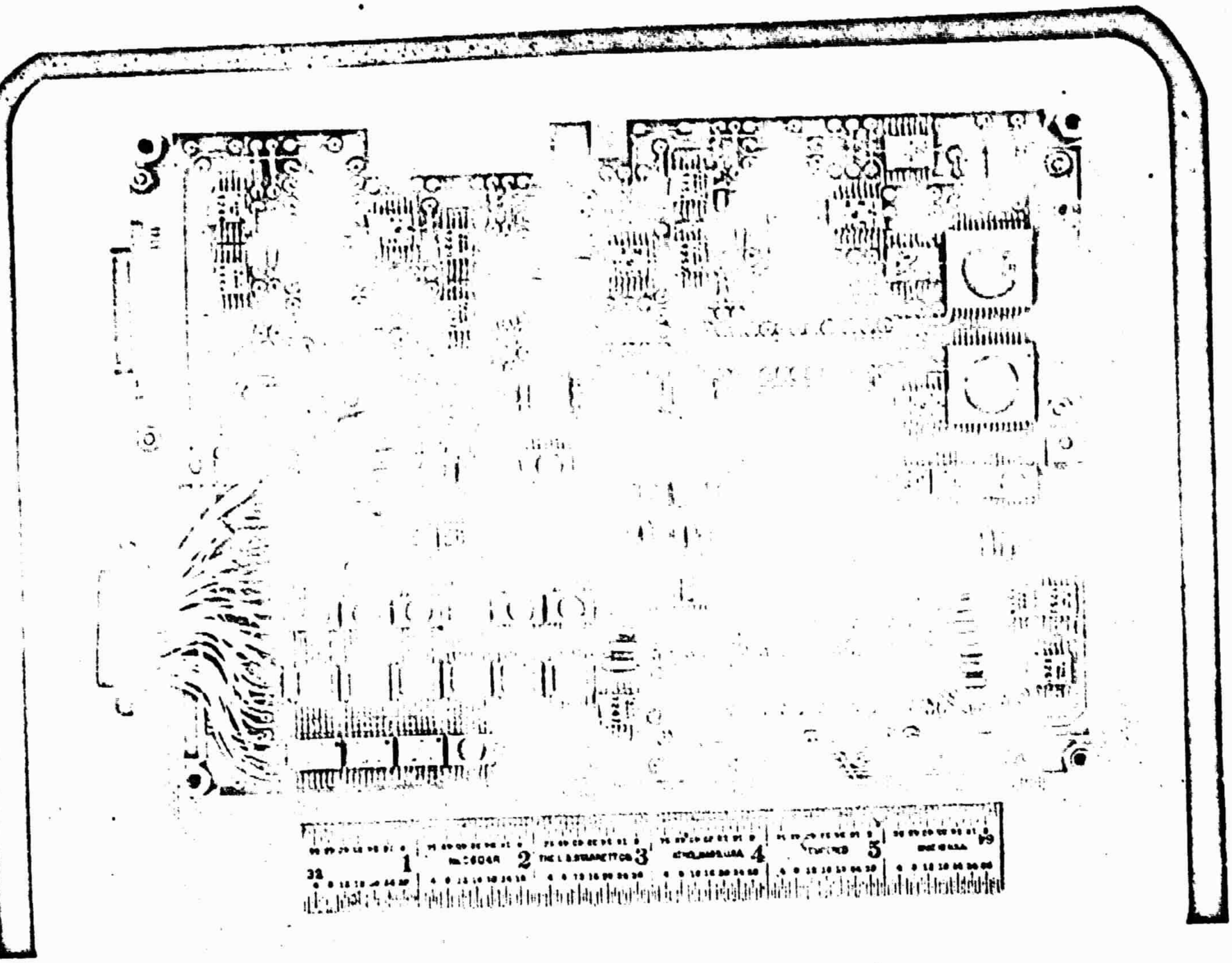
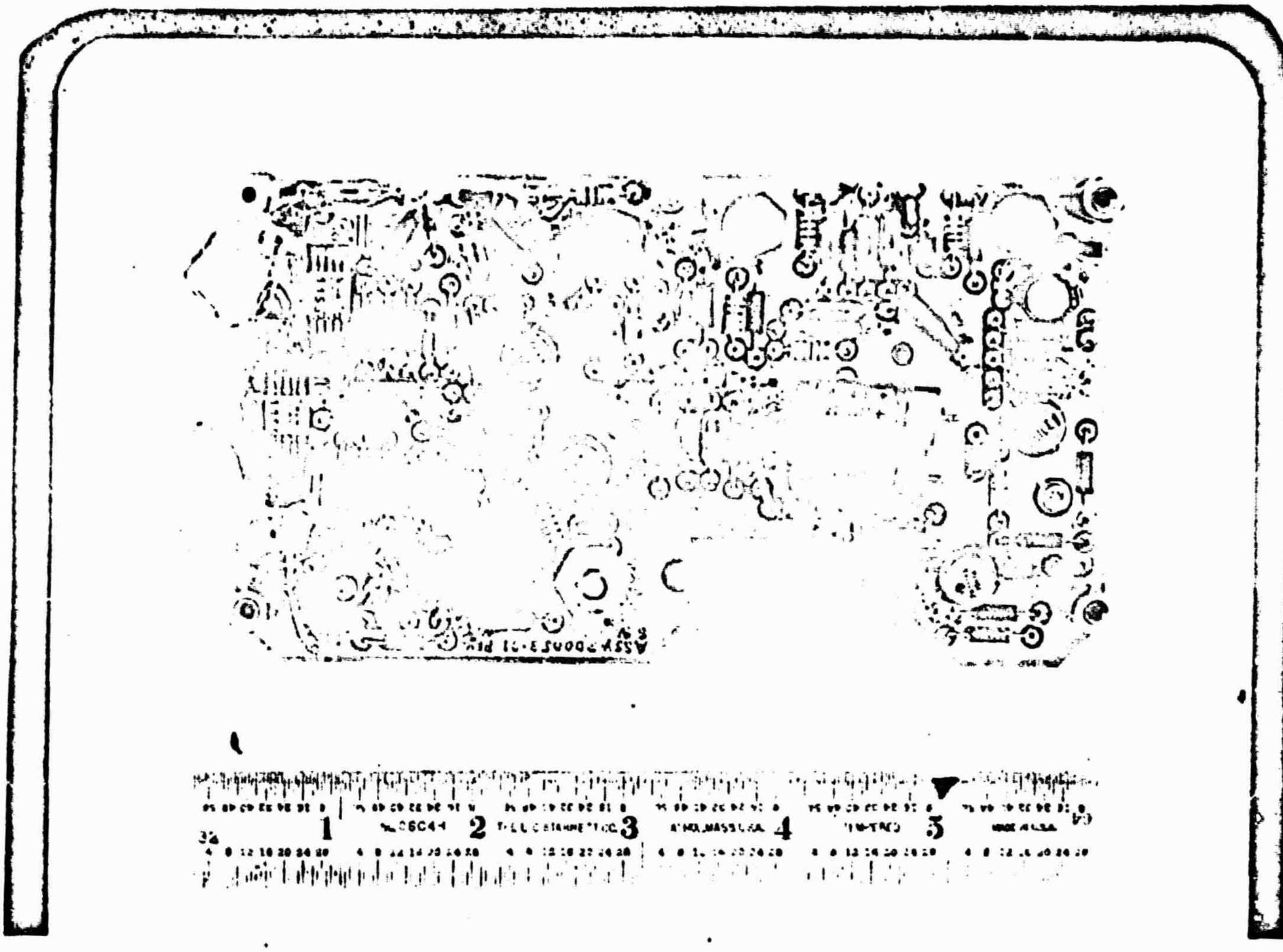


ANALOG PWB ASSEMBLY - 200059



DIGITAL PWB ASSEMBLY - 200061



R F PWB ASSEMBLY - 200053

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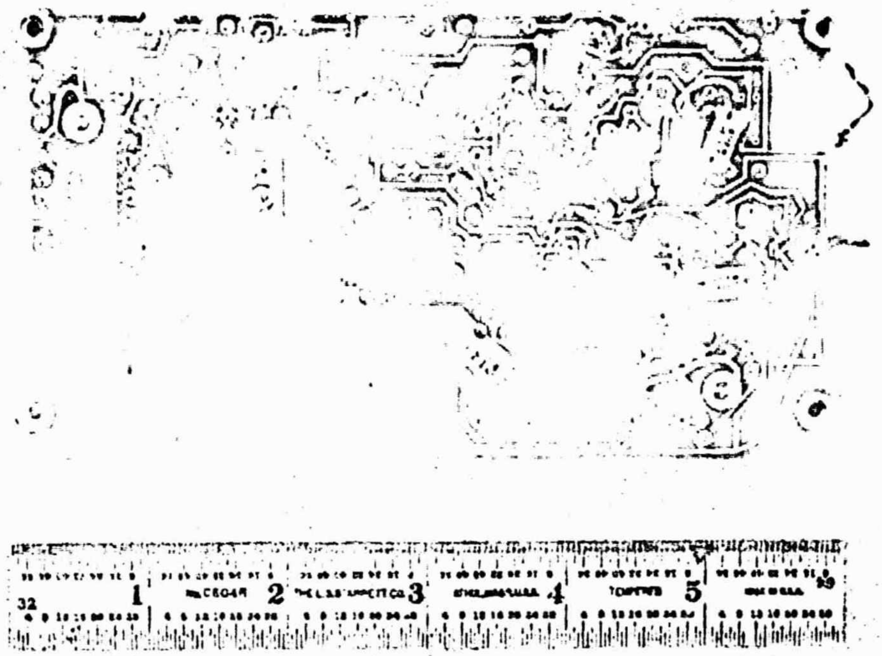

R F PWB ASSEMBLY (BACK SIDE) - 200053

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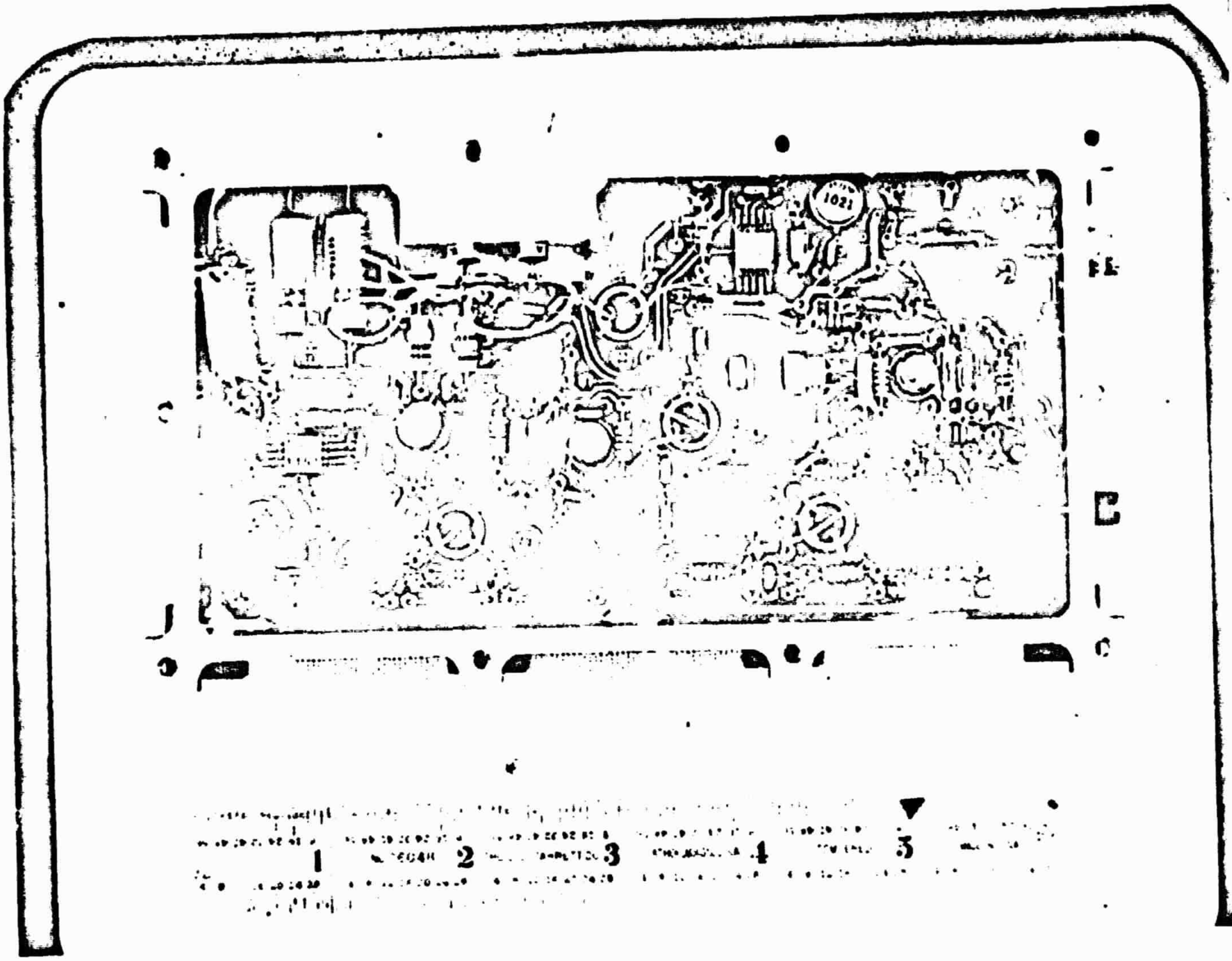
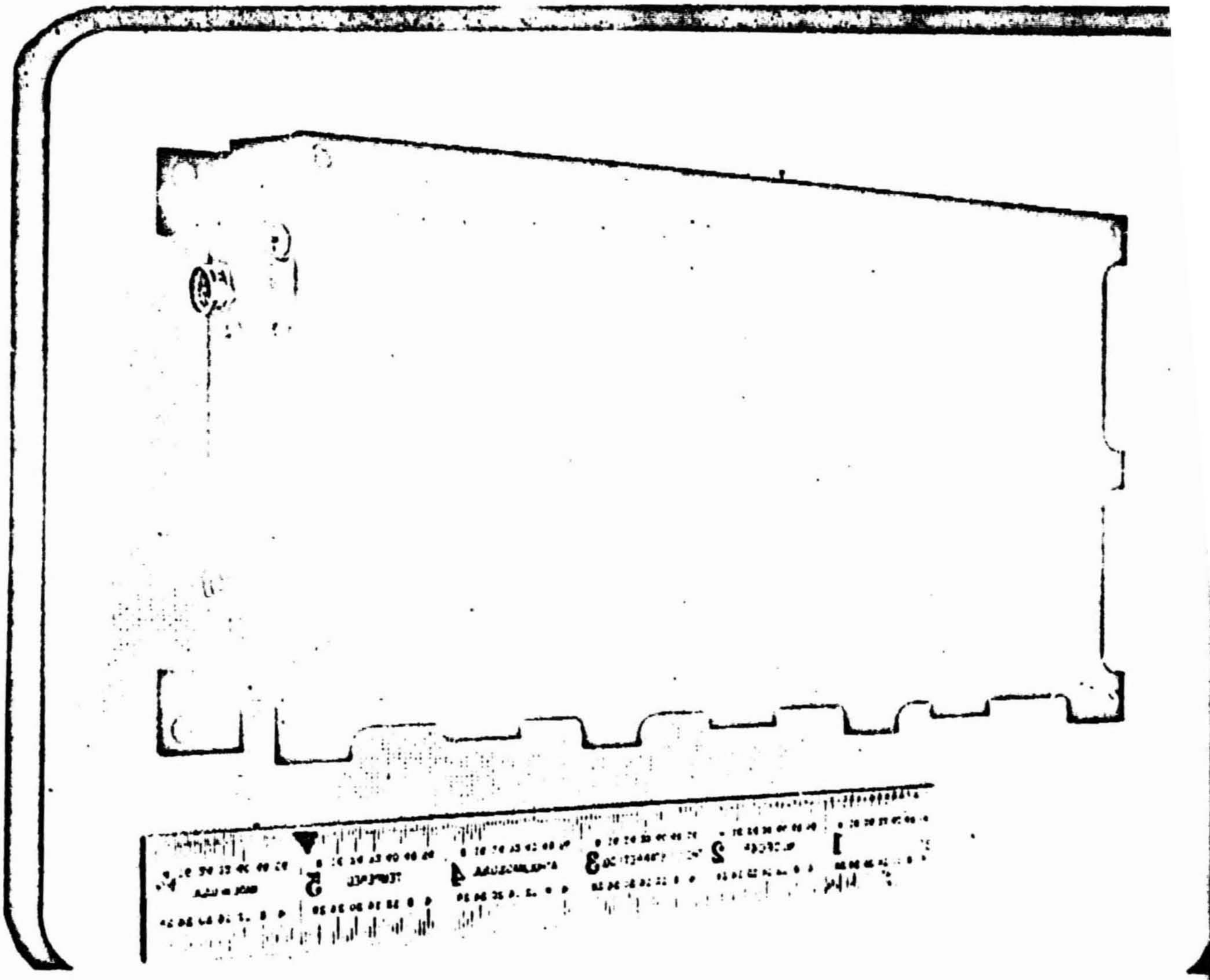
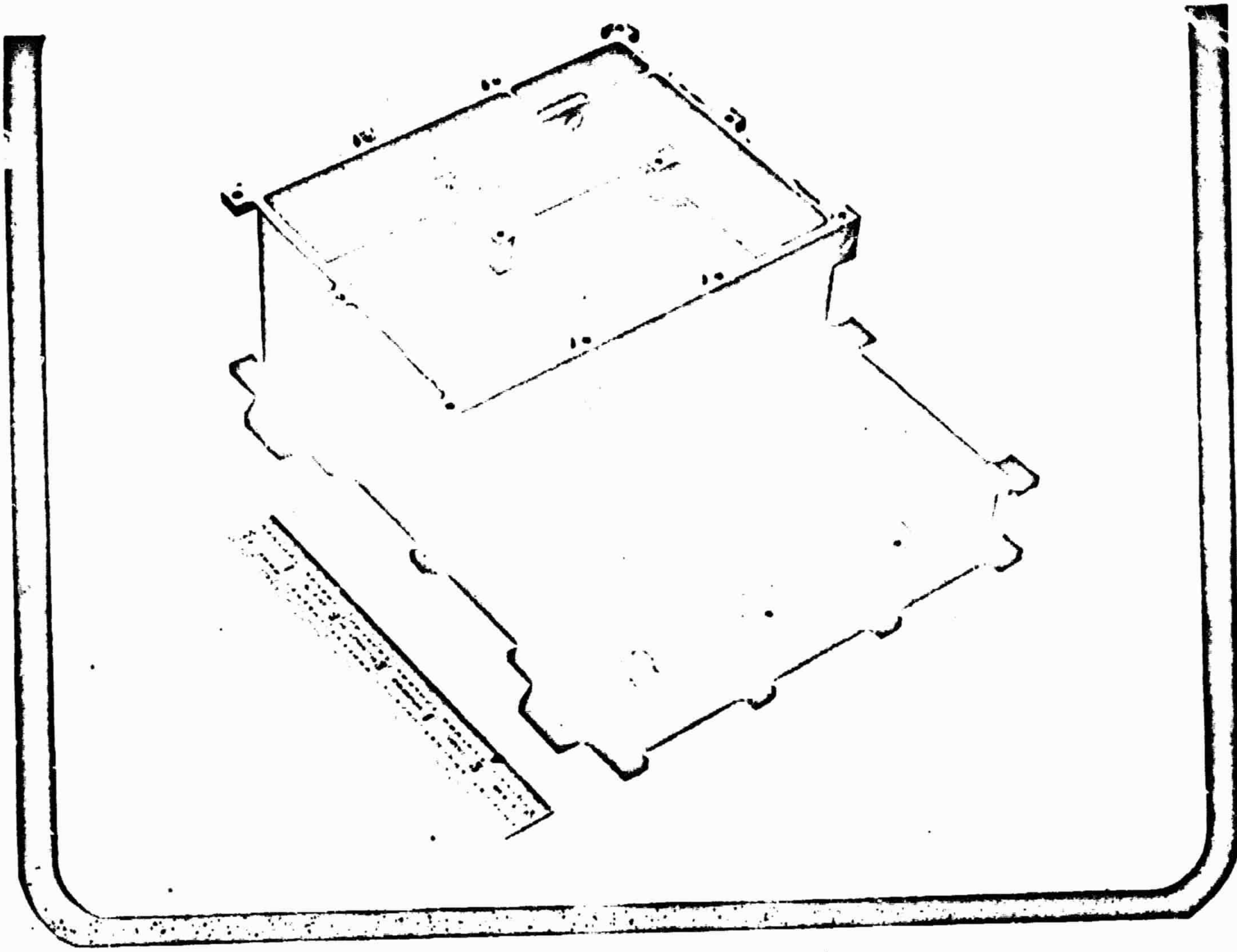


R F ASSEMBLY (LESS COVER) - 200057



R F ASSEMBLY - 200057

R F ASSEMBLY - 200057



ELECTRONIC HOUSING - 200052

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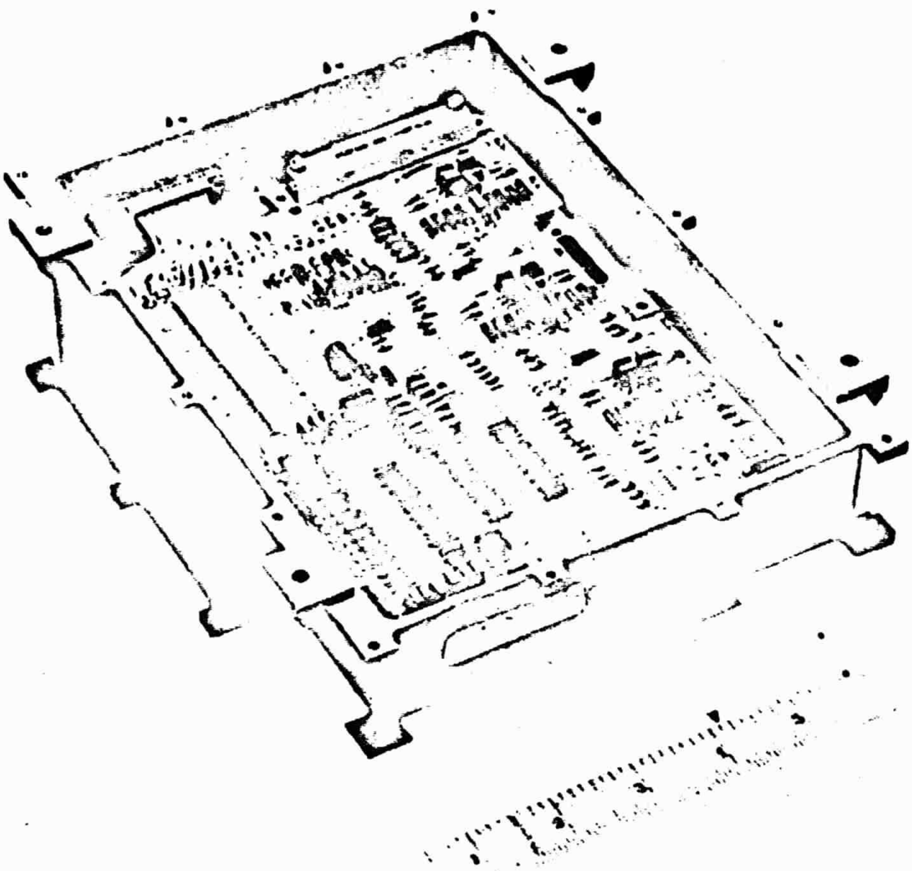
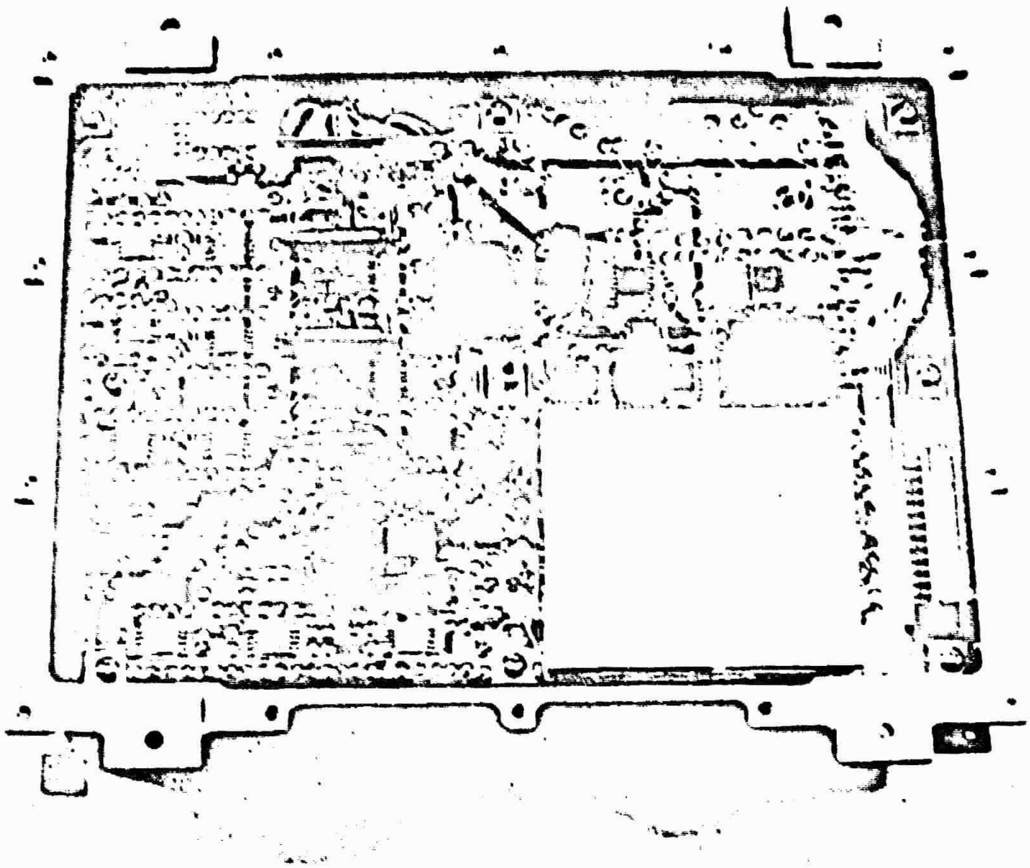


ELECTRONIC ASSEMBLY - 200056
(DIGITAL PWB SHOWN)



ELECTRONIC ASSEMBLY - 200056
(ANALOG PWB SHOWN)

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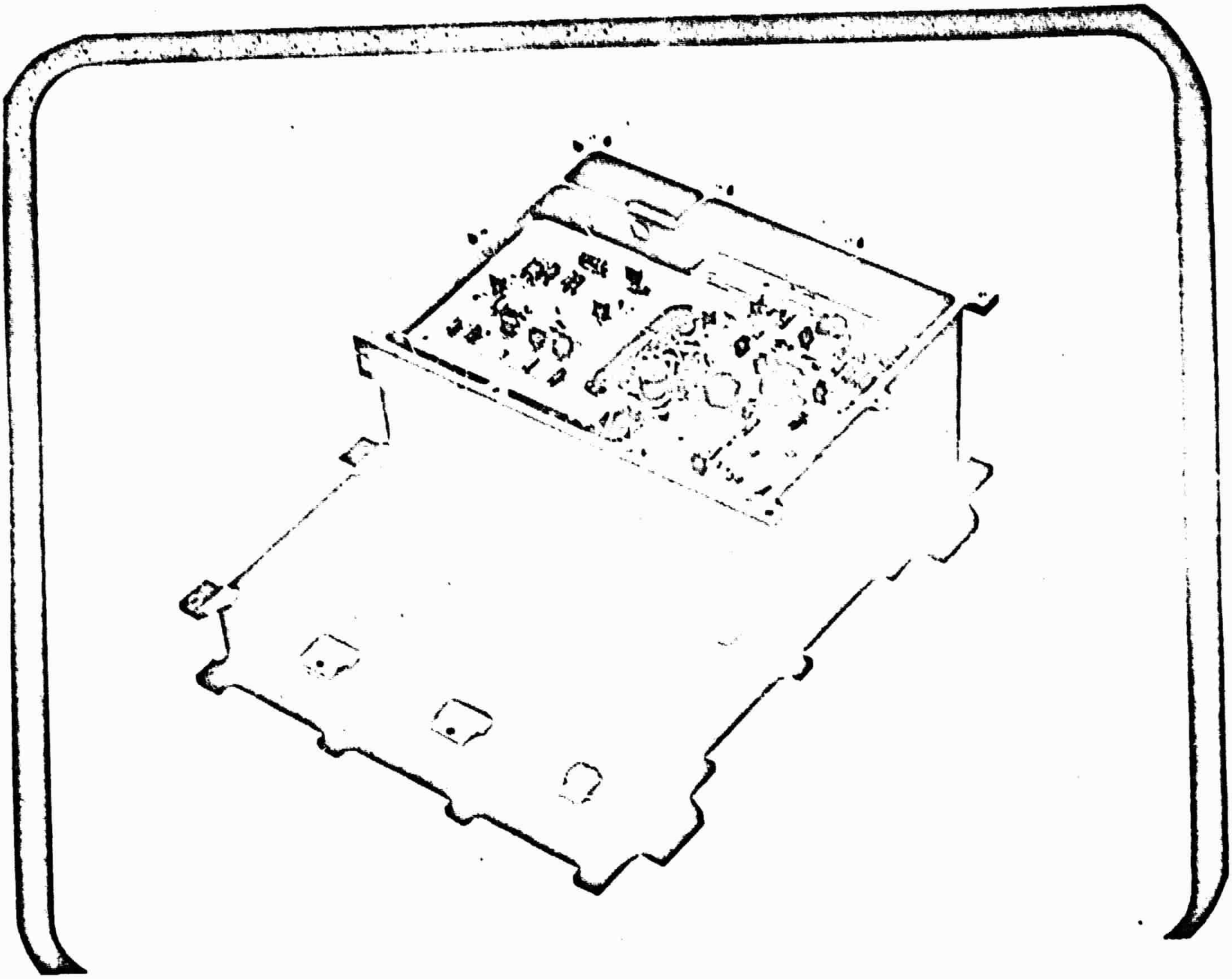

ELECTRONIC ASSEMBLY - 200056
(VIEW OF HEATER & LVPS)

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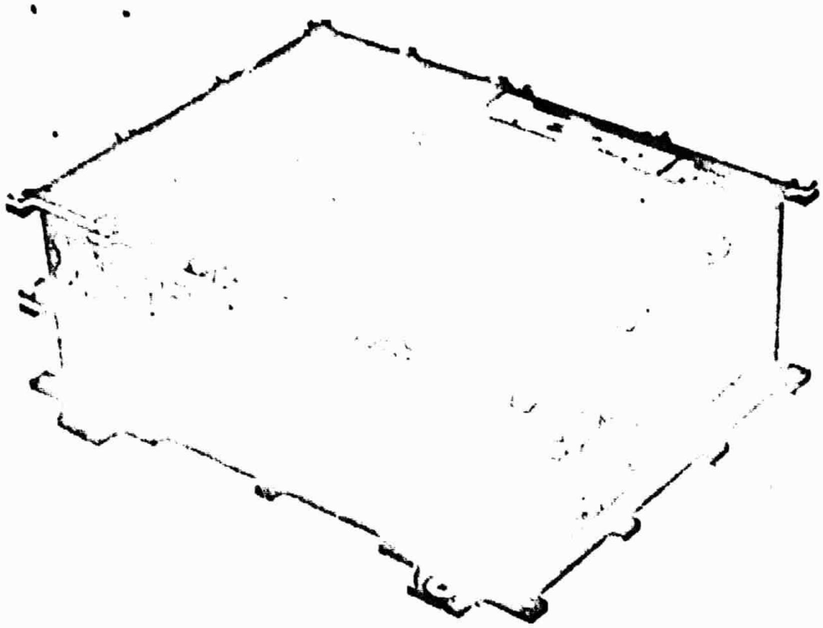


VHM ASSEMBLY - 200036

Table 7. Physical Requirements

PARAMETER	BOOM PACKAGE	ELECTRONICS
Weight (kg)	0.80[1]	1.38[2]
Dimensions (mm)	360 x 120 x 120[3]	146 x 203 x 75
Instrument power (watts)	0.8 watts RF[4]	2.20 watts
Heater power (watts)	0.88 watts maximum	0.26 watts maximum
Operating Temperature Range	-30° to + 30°C	-20° to + 50°C
Non-operating Temperature Range	-60° to + 40°C	-30° to + 60°C
Preferred Operating Temperature	0°C to + 10°C	$+15^{\circ}$ to + 25°C

NOTES: 1. Including thermal barrier and attachment provisions.

2. Including 0.11 kgm HED 01 - HED 02 interconnect harness.

3. Maximum envelope, including thermal blanket and thermal radiator.

4. 0.8 watts consists of 0.63 watts dissipated within sensor thermal blanket and 0.17 watts RF cable losses.

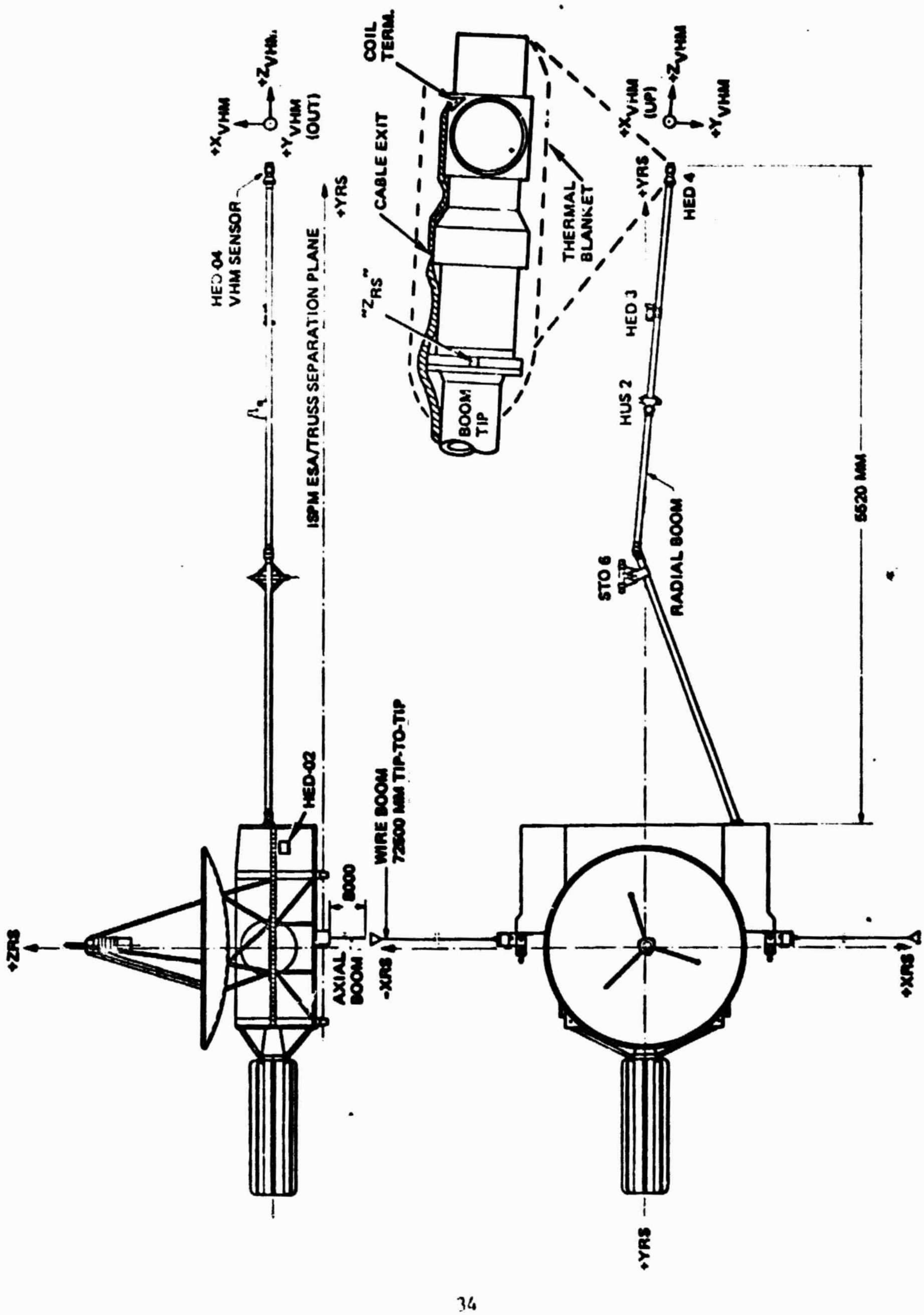


Figure 11. Orientation of VHM Sensor Axes

8. ENVIRONMENTAL REQUIREMENTS

The Solar Polar VHM shall be designed to meet the environmental requirements given in ESA Project documents ISPM-J-0257, ISPM-J-0360 and TSPM-P-300. Included in these documents are requirements and constraints on: DC magnetic Properties, AC magnetic properties, radio frequency interference (RFI), electromagnetic compatibility (EMC), electrostatic cleanliness (ESC), operating temperatures, vibration levels and radiation environment. In anticipation of the potentially damaging effects of the expected radiation dose, the VHM shall be designed to operate within the previously stated tolerances after exposure to 66 K Rads (Si) of energetic particle radiation.

9. BENCH CHECKOUT EQUIPMENT (BCE)

A block diagram of the VHM BCE is shown in Figure 12. Figure 13 illustrates the way in which the BCE is connected to the VHM electronics assembly.

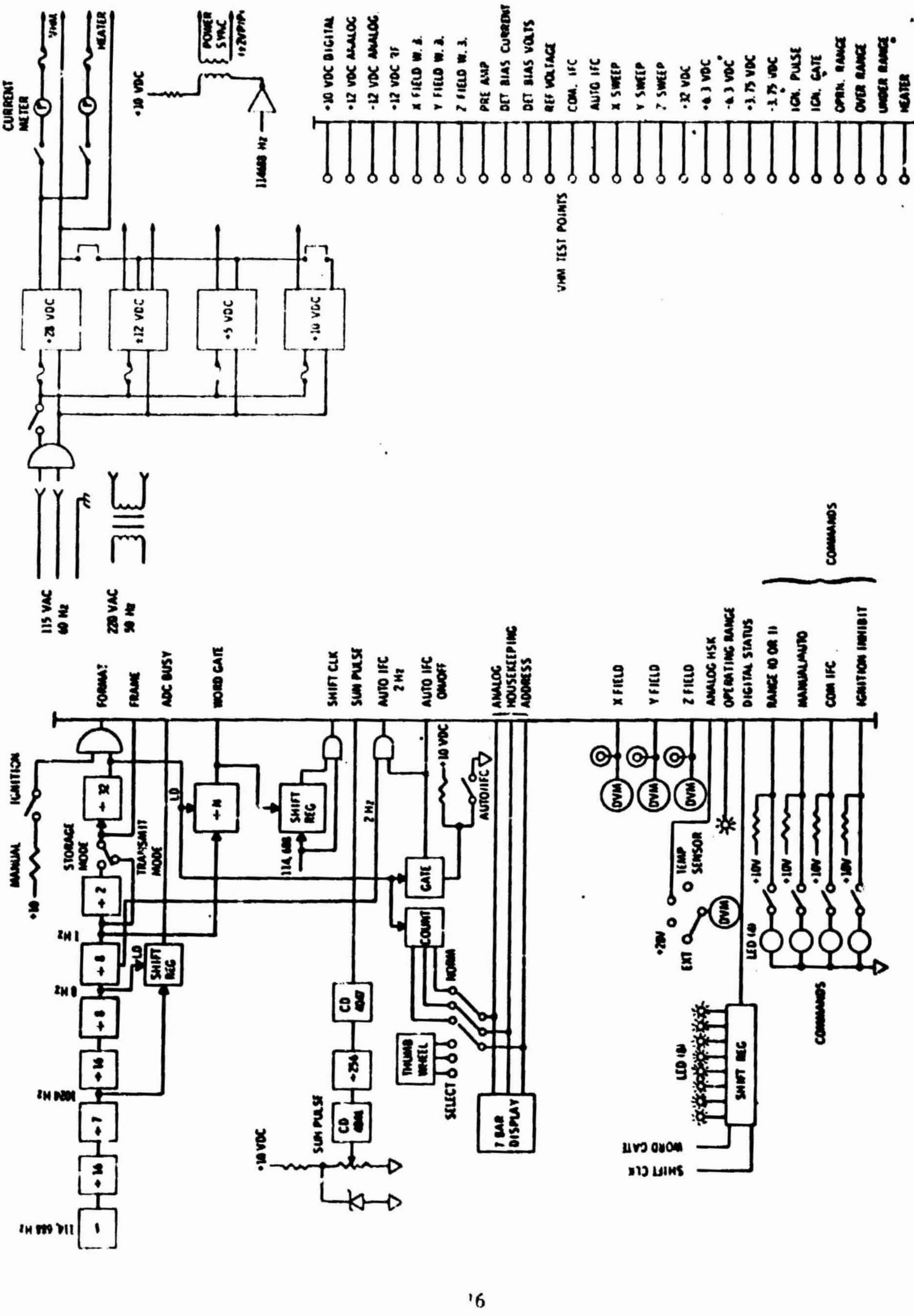


Figure 12. Block Diagram, VHM Bench Checkout Equipment

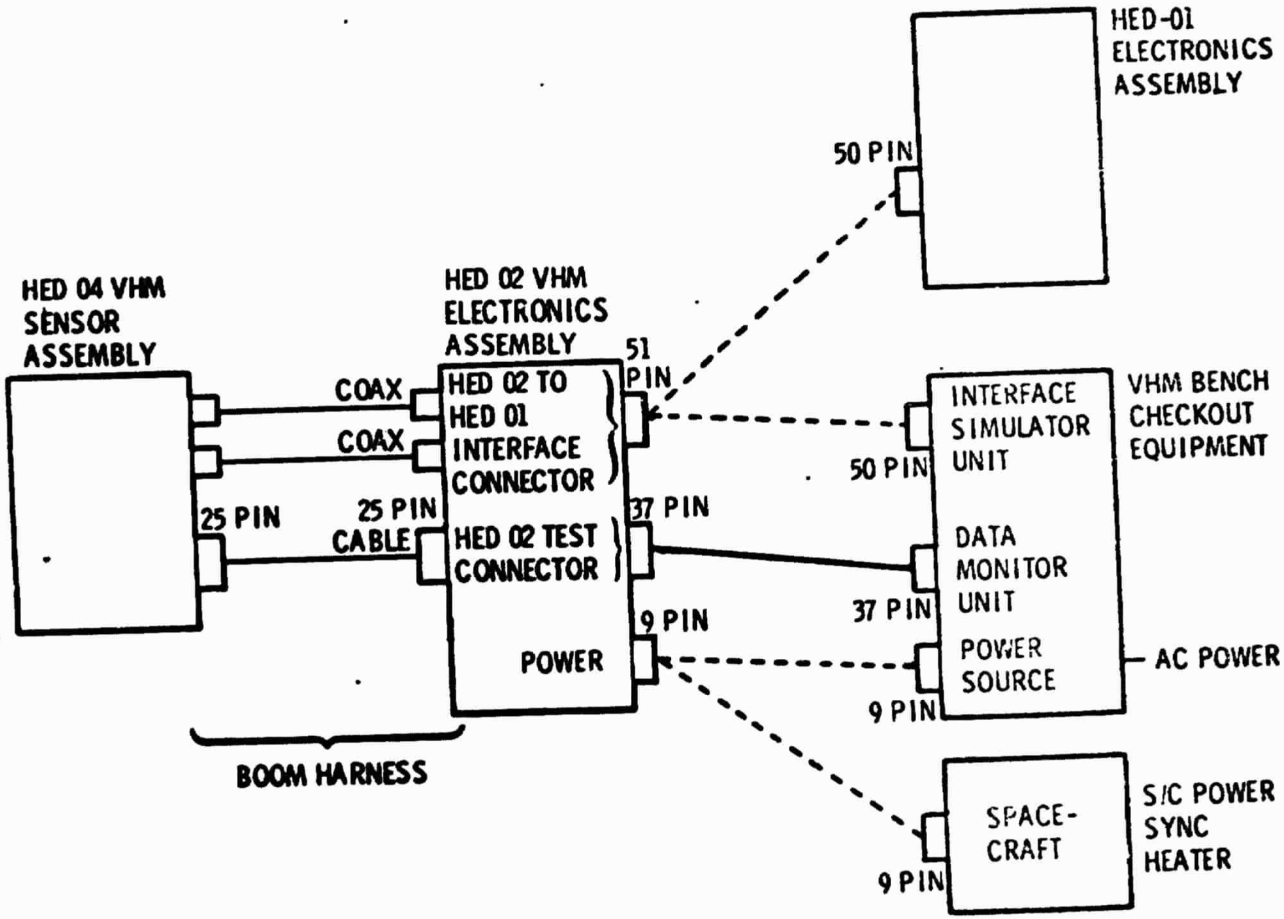


Figure 13. VHM BCE Connection Diagram

SECTION 3

MASTER DRAWING LIST (MDL 200036)

LIST OF DESIGN NOTES

SECTION 4

Loop Analysis Summary (DN 200036-66)

Aerospace Systems Division — Western Laboratories

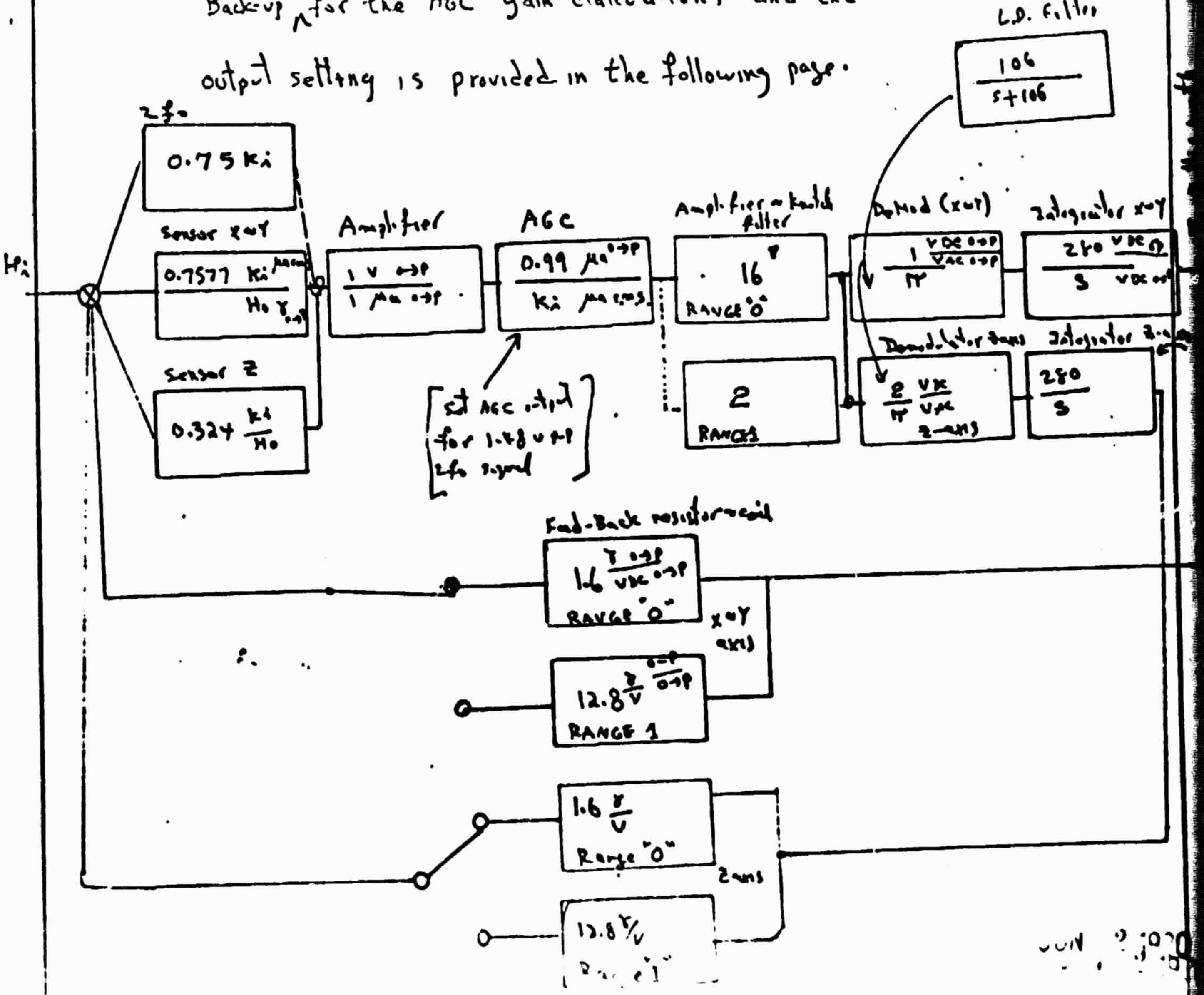
DESIGN NOTES

DN 200036-66	REV.	SHT 1 OF 2	TITLE Loop Analysis summary VHM
ORIG Dean D. Aalain	APP (WPB)	ISSUE DATE ... '80	REV. DATE

This Design Note is for Information only – No Action is required.

This Design Note summrizes & up dates the gains of various blocks of the VHM Instrument.

Back-up information for the AGC gain claculations and the output setting is provided in the following page.



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AGC Gain is calculated in this design note.

To obtain a critically damped system, the loop gain must be set equal to 53.31. Knowing the gain of all the various blocks in the loop, except the AGC, and the Total loop gain, The AGC Gain can be calculated as follows:

$$53.31 = \left(0.7577\,\frac{Ki}{H_0}\,\frac{\mu a\ rms}{\gamma\ 0\to p}\right)\left(\frac{1\ V\ 0\to p}{\mu a\ 0\to p}\right)\left(\frac{A\ \mu a\ 0\to p}{Ki\ \mu a\ rms}\right)(16)\left(\frac{1}{\pi}\ \frac{V\ DC\ 0\to p}{V\ AC\ 0\to p}\right)(280)\left(1.6\ \frac{\gamma\ 0\to p}{V\ 0\to p}\right)$$

$A = 0.99\ \mu a\ 0\to p$

$$\text{AGC output} = \left(0.75\ Ki\right)\left(\frac{1\ V}{\mu a}\right)\left(\frac{0.99\ \mu a\ 0\to p}{\cancel{Ki}}\right)\left(2\ \frac{0\to p}{p\text{-}p}\right) = 1.48\ \text{volts p-p}$$

SECTION 5

MECHANICAL DRAWINGS

VECTOR HELIUM MAGNETOMETER (TOP DRAWING 200036)

ELECTRONICS ASSEMBLY (200056)

RF ASSEMBLY (200057)

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Ball Aerospace Systems Division — Western Laboratories

DOCUMENT NUMBER ASSIGNMENT

DOCUMENT NUMBER	DOC. SIZE	DOCUMENT TITLE	PROJECT NO.	ASSIGNED TO	ISSUED DATE
DN200036-1	A	ISPM VHM Design Note Index	010	Takahashi	8-21-79
DN200036-2	A	General Design Requirements (ISPM VHM)	010	Takahashi	8-22-79
DN200036-3	A	Coil Drive Resistors Design/Analysis (ISPM VHM)	010	Takahashi	9-5-79
DN200036-4	A	Circuit Design Task Description	010	Takahashi	9-5-79
DN200036-5	A	RF Supply Design Requirements	010	Takahashi	9-5-79
DN200036-6	A	Parts Selection List	010	Takahashi	9-12-79
DN200036-7	A	Pre Amp Design Requirements	010	Takahashi	9-14-79
DN200036-8	A	Logic/Analog Interface	010	Takahashi	9-18-79
DN200036-9	A	Power Estimate	010	Takahashi	9-18-79
DN200036-10	A	Low Voltage Power Supply Design Requirements	010	Takahashi	9-21-79
DN200036-11	A	Sweep Oscillator	010	Walstrom	10-5-79
DN200036-12	A	CD 4051-3 Analysis	010	Cervin	10-12-79
DN200036-13	A	Igniter Design Requirements	010	Takahashi	10-8-79
DN200036-14	A	Heater Controller Design Requirements	010	Takahashi	10-10-79
DN200036-15	A	Output Filter	010	Wahlstrom	10-11-79
DN200036-16	A	Reference Voltage Design	010	Juergens	10-15-79
DN200036-17	A	RF Supply Design	010	Takahashi	10-15-79
DN200036-18	A	Coil Driver Resistors Final Design	010	Takahashi	10-24-79
DN200036-19	A	Range Detector Design	010	Juergens	10-17-79
DN200036-20	A	Notch Filter	010	Wahlstrom	10-17-79

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Ball Aerospace Systems Division — Western Laboratories

DOCUMENT NUMBER ASSIGNMENT

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DN200036-21	A	VHM Interfaces	010	Cerin	10-18-79
DN200036-22	A	AGC Amplifier Design	010	Juergens	10-24-79
DN200036-23	A	VHM Electronics Weight Estimate	010	Takahashi	10-29-79
DN200036-24	A	Switch Gain Amplifier Design	010	Juergens	10-26-79
DN200036-25	A	Reference Generator Design	010	Wahlstrom	11-1-79
DN200036-26	A	Heater Control & Monitor Design	010	Burtis/Taka.	11-2-79
DN200036-27	A	Igniter Design	010	Takahashi	11-5-79
DN200036-28	A	Integrator Demodulator	010	Juergens	11-5-79
DN200036-29	A	LVPS Design	010	Takahashi	11-12-79
DN200036-30	A	Phase Shift Analysis	010	Takahashi	11-12-79
DN200036-31	A	Logic Design	010	Takahashi	11-12-79
DN200036-32	A	Preamp Design	010	Maloy	11-16-79
DN200036-33	A	+3.75V Ref. Circuit Modification	010	Aalami	2-27-80
DN200036-34	A	Recalculate Upper & Lower Threshold Resistors	010	Aalami	2-27-80
DN200036-35	A	DR-9 Relate Results of Loop Analysis Integrator & L.D. Filter Redesign	010	Aalami	2-27-80
DN200036-36	A	Change Sweep Amplitude from 80r/60r	010	Aalami	2-27-80
DN200036-37	A	Switch Gain Amplifier Design Change "16 & 2" Gains	010	Aalami	2-27-80
DN200036-38	A	-7 Volts Reference	010	Aalami	2-27-80
DN200036-39	A	Integrator Resitor Selection Requirement	010	Aalami	2-27-80
DN200036-40	A	Modify MUX Control	010	Aalami	2-27-80

WL 4-13(10-78)

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Ball Aerospace Systems Division — Western Laboratories

DOCUMENT NUMBER ASSIGNMENT

DOCUMENT NUMBER	DOC. SIZE	DOCUMENT TITLE	PROJECT NO.	ASSIGNED TO	ISSUED DATE
DN200036-41	A	Incorporate Diode Clamps	010	Aalami	2-27-80
DN200036-42	A	+3.75 V Reference Calculation	010	Aalami	2-27-80
DN200036-43	A	VHM Crosstalk (Conclusions)	010	Cashin	2-27-80
DN200036-44	A	Preamplifier Bandwidth Change Implementation	010	Aalami	2-27-80
DN200036-45	A	Open Coil Protection Resistors	010	Cashin	3-4-80
DN200036-46	A	VHM Loop Gain	010	Cashin	3-4-80
DN200036-47	A	Ignition Status Driscriminator Design	010	Aalami	3-5-80
DN200036-48	A	+6.3 Volts Analog Status Divider Network	010	Aalami	3-5-80
DN200036-49	A	Sweep AMP Attenuation VHM	010	Cashi	3-10-80
DN200036-50					
DN200036-51	A	Bunn Comments PDR	010	Cashin	4-17-80
DN200036-52	A	Summary of Recommendations from Bunn Comments Response	010	Cashin	4-3-80
DN200036-53	A	VHM Grounding Guidelines	010	Aalami	3-19-80
DN200036-54	A	Magnetometer Power Supply Stabilization	010	Cashin	4-3-80
DN200036-55	A	EMI Inductor	010	Aalami	4-3-80
DN200036-56	A	-9 Volts Reference Lock up Problem Fix	010	Aalami	4-3-80
DN200036-57	A	Ignition Circuit On/Off Circuit	010	Aalami	4-3-80
DN200036-58	A	+12 V RF Inductor	010	Aalami	4-3-80
DN200036-59	A	VHM Full Wave Demodulator	010	Cashin	4-9-80
DN200036-60	A	VHM Butterworth Radiation	010	Cashin	4-9-80

Ball Aerospace Systems Division — Western Laboratories

DOCUMENT NUMBER ASSIGNMENT

DOCUMENT NUMBER	DOC. SIZE	DOCUMENT TITLE	PROJECT NO.	ASSIGNED TO	ISSUED DATE
DN200036-61	A	VHM Crosstalk Adjustment	010	Cashin	4-17-80
DN200036-62	A	VHM System Bandwith	010	Cashin	4-24-80
DN200036-63	A	VHM Ref. Offset Corrections	010	Cashin	4-24-80
DN200036-64	A	VHM EMI Filter Part Numbers	010	Aalami	4-24-80
DN200036-65	A	VHM Minor Changes	010	Cashin	4-30-80
DN200036-66	A	Loop Summary Analysis VHM	010	Aalami	5-30-80
DN200036-67	A	Changes in the Offset Due to Range Switching	010	Aalami	5-30-80
DN200036-68	A	Modification of Protection Diodes	010	Aalami	5-30-80
DN200036-69	A	VHM Interface Analysis	010	Molin	6-18-80
DN200036-70	A	RF OSCILLATOR Series Regulator VHM	010	Aalami	6-19-80
DN200036-71	A	Primary Voltage Regulator VHM-LVPS	010-I	Aalami	7-10-80
DN200036-72	A	Input Filter Analysis	010	Aalami	7-10-80
DN200036-73	A	LM 108A Temperature rise when short circuited	010	Aalami	7-29-80
DN200036-74	A	LVPS Analysis DC Stability, VHM	010	Aalami	7-29-80
DN200036-75	A	Interface Drawing Power Converter & Heater CKT VHM	010	Aalami	8-7-80
DN200036-76	A	L. V. P. S. Analysis Sync. Circuit VHM	010	Aalami	8-22-80
DN200036-77	A	TI Transformer, LVPS VHM	010	Aalami	9-11-80
DN200036-78	A	L. V. P. S. Analysis Sync. Circuit VHM	010	Aalami	10-3-80
DN200036-79	A	VHM RF Analysis	010	Cashin	10-3-80
DN200036-80	A	VHM LVPS Frequency Stability Analysis	010	Aalami	10-22-80

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Aerospace Systems Division

Western Laboratories

DOCUMENT NUMBER ASSIGNMENT

DOCUMENT NUMBER	DOC. SIZE	DOCUMENT TITLE	PROJECT NO.	ASSIGNED TO	ISSUED DATE
DN200036-81	A	Preamp Analog Housekeeping Monitor Circuit	010	Aalami	10-27-80
DN200036-82	A	VHM RF Phase Shift	010	Cashin	11-11-80
DN200036-83	A	VHM RF Margins	010	Cashin	11-11-80
DN200036-84	A	VHM RF Test Alignment Procedure	010	Cashin	11-11-80
DN200036-85	A	VHM Updated RF Schematic	010	Cashin	11-11-80
DN200036-86	A	VHM RF Update	010	Cashin	11-18-80
DN200036-87	A	VHM RF Data	010	Cashin	11-21-80
DN200036-88	A	VHM RF Output Stage Sensitivities	010	Cashin	11-21-80
DN200036-89	A	VHM AGC Drift	010	Cashin	11-21-80
DN200036-90	A	VHM LVPS Control Winding Analysis	010	Aalami	11-21-80
DN200036-91	A	Response to TDM No. 048 ISPM VHM LVPS	010	Aalami	11-21-80
DN200036-92	A	Response to TDM ISPM VHM 051	010	Aalami	11-21-80
DN200036-93	A	Response to RDM ISPM VHM 050	010	Aalami	11-21-80
DN200036-94	A	HES2 Converter Synchronization Interface Review	010	Aalami	11-21-80
DN200036-95	A	Sheild Ground for the Heater Sensor vhm LVPS	010	Aalami	12-3-80
DN200036-96	A	VHM 2fo Monitor	010	Cashin	12-3-80
DN200036-97	A	VHM RF Transistor Selection	010	Cashin	12-18-80
DN200036-98	A	VHM RF Approximate Worst Case Power Dissipations	010	Cashin	12-18-80
DN200036-99	A	VHM Bessel Filter	010	Cashin	2-9-81
DN200036-100	A	VHM RF Beta Driver Transistor	010	Cashin	2-16-80

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Ball Aerospace Systems Division — Western Laboratories

DOCUMENT NUMBER ASSIGNMENT

DOCUMENT NUMBER	DOC. SIZE	DOCUMENT TITLE	PROJECT NO.	ASSIGNED TO	ISSUED DATE
DN200036-101	A	VHM Bessel Filter Update	010	Cashin	2-16-80
DN200036-102	A	VHM Structure Analysis	010	S. Moe	3-10-81
DN200036-103	A	VHM Thermal Analysis	010	S. Moe	3-10-81
DN200036-104	A	VHM RF Prototype Checkout	010	Cashin	3-12-81
DN200036-105	A	VHM Bessel Selection - Alignment	010	Cashin	3-26-81
DN200036-106	A	VHM Pad Material	010	S. Moe	4-10-81
DN200036-107	A	VHM Select Resistor Screening	010	Cashin	4-27-81
DN200036-108	A	VHM RF Corrections	010	Cashin	5-14-81
DN200036-109	A	Cleaning Procedure for ISPM VHM Electronics PWBA s	010	Aalami	8-12-81
DN200036-110	A	Strength Analysis of Mounting Tabs on VHM	010	R. Johnson	9-18-81

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APPLICATION	
NEXT ASSY	FINAL ASSY
FINAL	200036

PARTS DISPOSITION
1. USE 2. REWORK 3. CANNOT BE REWORKED 4. RECORD 5.

DWG. NO. MDL 200036 REV D

REVISIONS

DISP	EFF	REV	DESCRIPTION	BY	CK	DATE	APPD
4	SN1 & UP	A	GENERAL REVISION			4/13/81	
4	SN1 & UP	B	ADDED NOTES ADDED DWGS FOR 2		WPBJ	6/7/81	
4	SN1 & UP	C	SH 2, ADDED ITEM 24 SH 6, ADDED ITEMS 37, 39, 41 SH6, QTY ITEM 35 WAS 9		WPBJ	7/30/81	DA
4	SN1 & UP	D	SH 6 DELETED ITEMS 37 39 41		WPBJ	10/2/81	DA

NOTES: UNLESS OTHERWISE SPECIFIED
1. USED ON 200036-01 ASSY ONLY. (PROTOFLIGHT)
2. USED ON 200036-02 ASSY ONLY. (FLIGHT)

INTERPRET THIS DRAWING PER STANDARDS IN MIL-D-1000
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS: X ± .1, XX ± .03, XXX ± .010
ANGLES: ± 0° 30'
XXXX ± .0050
√ SURFACE ROUGHNESS

CONTRACT NO.		
DRAWN	WPBJ	1-13-81
CHECK	R.K.C.	1-15-81
MECH ENGR		1/14/81
ELECT ENGR		1-16-81
PROJ MGR		
APPD		1-13-81

Aerospace Systems Division — Western Laboratories, Gardena, California 90247

TITLE: MASTER DRAWING LIST VHM ASSY

SIZE	CODE IDENT NO.	DWG NO.	REV
A	13126	MDL 200036	D

SHEET 1 OF 2

ORIGINAL PAGE IS
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LINE NO.	ASSEMBLY POSITION 1	2	3	4	5	6	7	8	9	QTY	DRAWING NUMBER	REV LTR	EO CODE	DRAWING TITLE	DWG SIZE
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13	X									Ref.	200037			ICD MECH	E
14															
15	X									Ref.	MDL 200036			MDL VHM ASSY	A
16															
17	X									Ref.	CPL 200036			CPL VHM ASSY	A
18	X									REF	MPL 200036			MPL VHM ASSY	A
19	X									REF	200363			HOLDING FIXTURE	C
20															
21										1	200036-01,-02			VHM ASSY	D
22															
23		X								Ref.	AP200036-01			ASSY PLAN	A
24		X								1	200364-11			EMI SHIELD	C
25		X								Ref.	S200036			TEST SPEC	A
26		X								2	200351-11			PAD, ISOLATION	D
27		X								4	200351-12			PAD, ISOLATION	D
28		X								2	200351-13			PAD, ISOLATION	D
29										1	200057-01			RF ASSY	E
30															
31															A
32															
33			X							Ref.	AP200057-01			ASSY PLAN	A
34															
35			X							Ref.	S200057			TEST SPEC	A
36															
37															
38															
39										1	200053-01		1	PWB ASSY - RF	E
40				X						1	200359-01		2	PWB ASSY - RF	D
41				X						1	200054-11		1	PRINTED WIRING BOARD	E
42				X						1	200360-11		2	PRINTED WIRING BOARD	C
43					X					Ref.	PC200054		1	ARTWORK	E
44					X					REF	PC 200360		2	ARTWORK	E
45				X						Ref.	SCH 200053			SCHEMATIC	E
46															
47				X						Ref.	PL200053-01		1	PARTS LIST	A
48				X						REF	PL 200359-01		2	PARTS LIST	A
49				X						Ref.	AP200053-01		1	ASSY PLAN	A
50				X						REF	AP 200359-01		2	ASSY PLAN	A

MODEL NO.

TITLE	SIZE	CODE IDENT NO.	DWG NO.	REV
MASTER DRAWING LIST VHM ASSY	A	13126	MDL 200036	D

ORIGINAL PAGE IS
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LINE NO.	1	2	3	4	5	6	7	8	9	QTY	DRAWING NUMBER	REV LTR	EO CODE	DRAWING TITLE	DWG SIZE
2				X						REF	S200053		1	TEST SPEC	A
3				X						REF	S200359		2	TEST SPEC	A
4				X						1	200244-11		1	PLATE, CONDUCTOR	D
5				X						1	200361-11		2	HEATSINK, Q4	C
6				X						3	200245-11			SPACER	D
7				X						1	200362-11		2	HEATSINK, Q2, Q3, Q5, Q6	C
8				X						2	200243-2			CHOKE-.1 µH - .8 µH	A
9															
10				X						2	200243-1			CHOKE .30 µH ±2%	A
11															
12			X							1	200343-12		1	HEATSINK Q2	D
13															
14			X							1	200343-13		1	HEAT SINK Q5	D
15															
16			X							1	200343-14		1	HEAT SINK Q6	D
17															
18			X							1	200343-11		1	HEAT SINK Q3	D
19															
20			X							1	200344-11		1	HEAT SINK Q4	D
21															
22			X							1	200345-11			GASKET, CONNECTOR-SMA	D
23															
24			X							1	200345-12			GASKET, CONNECTOR-SMA	D
25															
26			X							1	200041-11			GASKET, COVER	D
28			X							1	200346-11			PLATE, MTG, CONN, RF ASSY	D
29															
30															
31															
32			X							1	200224-11			COVER.	E
33															
34			X							1	200052-01			HOUSING	E
35															
36			X							1	200079-11		1	NUTPLATE (Q2, Q3, Q5, Q6)	D
37															
38			X							1	200079-12		1	NUTPLATE (Q4)	D
39															
40															
41															
42															
43															
44															
45															
46															
47															
48															
49															
50															

MODEL NO.

MASTER DRAWING LIST VHM ASSY	SIZE	CODE IDENT NO.	DWG NO.	REV
	A	13126	MDL 200036	D

ORIGINAL PAGE IS
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LINE NO.	ASSEMBLY POSITION 1	2	3	4	5	6	7	8	9	QTY	DRAWING NUMBER	REV LTR	E O CODE	DRAWING TITLE	DWG SIZE
1															
2															
3															
4		□								1	200056-01			ELECTRONICS ASSY	E
5															
6			X							Ref	PL200056-01			PARTS LIST	A
7															
8			X							Ref	AP200056-01			ASSY PLAN	A
9															
10			X							Ref	S200056			TEST SPEC	A
11															
12															
13															
14										1	200050-01			PWB ASSY-LVPS	E
15															
16				X						1	200051-11			PW BOARD	E
17															
18					X					Ref	PC200051			ARTWORK	E
19															
20				X						Ref	SCH 200050			SCHEMATIC	E
21															
22				X						Ref	PL200050-01			PARTS LIST	A
23															
24				X						Ref	AP200050-01			ASSY PLAN	A
25															
26				X						Ref	S200050			TEST SPEC	A
27															
28															
29															
30				X						1	200230			TRANSFORMER, POWER	A
31				X						REF	S200230			TEST SPEC, PWR XMFR	A
32				X						1	200231			TRANSFORMER, DRIVE	A
33				X						REF	S200231			TEST SPEC, DRIVE XMFR	A
34				X						1	200232			TRANSFORMER, RAMP GEN	A
35				X						REF	S200232			TEST SPEC, RAMP GEN XMFR	A
36				X						7	200229			INDUCTOR, 3.3 μH	A
37				X						REF	S200229			TEST SPEC, INDUCTOR, 3.3 μH	A
38				X						2	200236			INDUCTOR 1 μH	A
39				X						REF	S200236			TEST SPEC, INDUCTOR, 1 μH	A
40				X						1	200238-11			SPACER, TRANSFORMER	C
41															
42															
43															
44															
45															
46															
47															
48															
49															
50															

MODEL NO.

MASTER DRAWING LIST VHM ASSY	SIZE	CODE IDENT NO.	DWG NO.	REV
	A	13126	MDL 200036	D

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LINE NO.	ASSEMBLY POSITION 1	2	3	4	5	6	7	8	9	QTY	DRAWING NUMBER	REV LTR	EO CODE	DRAWING TITLE	DWG SIZE
2										1	200043-01			PWB ASSY, HEATER	D
3															
4				X						1	200044-11			PW BOARD	D
5															
6					X					Ref	PC200044			ARTWORK	E
7															
8				X						Ref	SCH200050			SCHEMATIC	E
9															
10				X						Ref	PL200043-01			PARTS LIST	A
11															
12				X						Ref	AP200043-01			ASSY PLAN	A
13															
14				X						Ref	S200043			TEST SPEC	A
15															
16															
17															
18															
19															
20										1	200061-01			PWB ASSY - DIGITAL	E
21															
22				X						1	200062-11			PW BOARD	E
23															
24					X					Ref	PC200062			ARTWORK	E
25															
26				X						Ref	SCH 200061			SCHEMATIC	E
27															
28				X						Ref	PL200061-01			PARTS LIST	A
29															
30				X						Ref	AP200061-01			ASSY PLAN	A
31															
32				X						Ref	S200061			TEST SPEC	A
33															
34															
35															
36										1	200059-01			PWB ASSY, ANALOG	E
37															
38				X						1	200060-11			PW BOARD	E
39															
40					X					Ref	PC200060			ARTWORK	E
41															
42				X						Ref	SCH200059			SCHEMATIC	E
43															
44				X						Ref.	PL200059-01			PARTS LIST	A
45				X						1	200265		1	TERMINAL ASSY, ANALOG	C
46				X						Ref.	AP200059-01			ASSY PLAN	A
47				X						REF	S 200059			TEST SPEC	A
48				X						1	200357-01		2	PW BD ASSY, PRE-AMP BUFFER	D
49					X					1	200358-11		2	PRINTED WIRING BOARD, PRE-AMP BUFF	D
50						X				REF	PC200358		2	ARTWORK	C

MODEL NO.

	SIZE	CODE IDENT NO.	DWG NO.	REV
MASTER DRAWING LIST VHM ASSY	A	13126	MDL 200036	D

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LINE NO.	ASSEMBLY POSITION 1	2	3	4	5	6	7	8	9	QTY	DRAWING NUMBER	REV LTR	EO CODE	DRAWING TITLE	DWG SIZE
2				X						1	200246-11			SHIELD	D
3				X						1	200246-12			SHIELD	D
4				X						2	200247-11			COVER, SHIELD	
5															
6				X						1	200256-11			BRACKET, MTG - Q4	D
7															
8															
9															
10															
11															
12															
13															
14															
15															
16			X							1	200046-11			PLATE, MTG - FILTER CAP	D
17															
18			X							1	200353-11			GASKET, CONN. PLATE	D
19															
20															
21															
22															
23															
24			X							1	200058-11			HOUSING, ELECTRONICS	J
25															
			X							1	200039-11			COVER, TOP	E
28			X							1	200348-11			COVER, REAR	E
29															
30															
31															
32															
33															
34			X							4	200355-11			STANDOFF (HTR)	C
35			X							9	200355-12			STANDOFF (ANA / DIG)	C
36			X							1	200355-13			STANDOFF (ANA / COV)	C
37															
38															
39															
40															
41															
42															
43															
44															
45															
46															
47															
48															
49															
50															

MODEL NO.

MASTER DRAWING LIST VHM ASSY	SIZE	CODE IDENT NO.	DWG NO.	REV
	A	13126	MDL 200036	D

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ENGINEERING ORDER

UNIT CODE 010A   RELEASED DEC 22 [illegible]

DRAWING TITLE	JOB NO.	CODE IDENT NO.	
RF ASSY VHM	2920	13126	EO — 200057 B-1

TYPE OF EO	DISPOSITION OF PARTS			
[X] CHANGE	[ ] USE	ORIG GAUGHEN DATE 12/22/81	NEXT ASSY 200036	EFFECTIVITY * SN 1 & UP
[ ] VARIANCE	[X] REWORK	CHECK	MODEL NO.	
[ ] SUPERSEDING	[ ] SCRAP	ENGR [signature] 12/22/81		
[ ] NOTED	[ ] NOTED BELOW	PM [signature] 12/22/81	OTHER DWGS AFFECTED NONE	ECP
		APPR [signature] 12/22/81		
		CUSTOMER WPBJ 12-22-81		SHT 1 OF 1

DESCRIBE CHANGE AND GIVE REASON: SMALL PATTERN NUT REQUIRED TO PREVENT INTERFERENCE

CHANGE ITEM 31 (SEE BELOW)

* SN 1 REPLACE AS REQD

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	QTY RF -02	NOTED ASSY -01	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	CODE IDENT	ZONE	ITEM NO
CHG TO	8	8	NAS671C-4	NAS671	NUT, HEX, CRES, SM PATTERN, 4-40 UNC-2B				31
CHG FROM	8	8	MS35649-244	MS35649	NUT #4-40 UNC-2B				31

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ENGINEERING ORDER

W L-4-5-A (1-78)

DIST CODE 010A RELEASED DEC 22 '81

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DRAWING TITLE	JOB NO.	CODE IDENT NO.	
RF ASSY VHM	2920	13126	EO — 200057 B-1

TYPE OF EO	DISPOSITION OF PARTS			
☒ CHANGE	☐ USE	ORIG GAUGHEN DATE 12/22/81	NEXT ASSY 200036	EFFECTIVITY *
☐ VARIANCE	☒ REWORK	CHECK	MODEL NO.	SN 1 & UP
SUPERSEDING	☐ SCRAP	ENGR [signature] 12/22/81		
☐ NOTED	☐ NOTED BELOW	PM [signature] 12/22/81	OTHER DWG AFFECTED NONE	ECP
		APPR [signature] 12/22/81		
		CUSTOMER WPRJ 12-22-81		SHT 1 OF 1

DESCRIBE CHANGE AND GIVE REASON: SMALL PATTERN NUT REQUIRED TO PREVENT INTERFERENCE

CHANGE ITEM 31 (SEE BELOW)

* SN 1 REPLACE AS REQD

	-02	-01	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	CODE IDENT	ZONE	ITEM NO.
CHG TO	8	8	NAS671C-4	NAS671	NUT, HEX, CRES, SM PATTERN, 4-40 UNC-2B	.			31
CHG FROM	8	8	MS35649-244	MS35649	NUT #4-40 UNC-2B				31

SECTION 6

SCHEMATICS

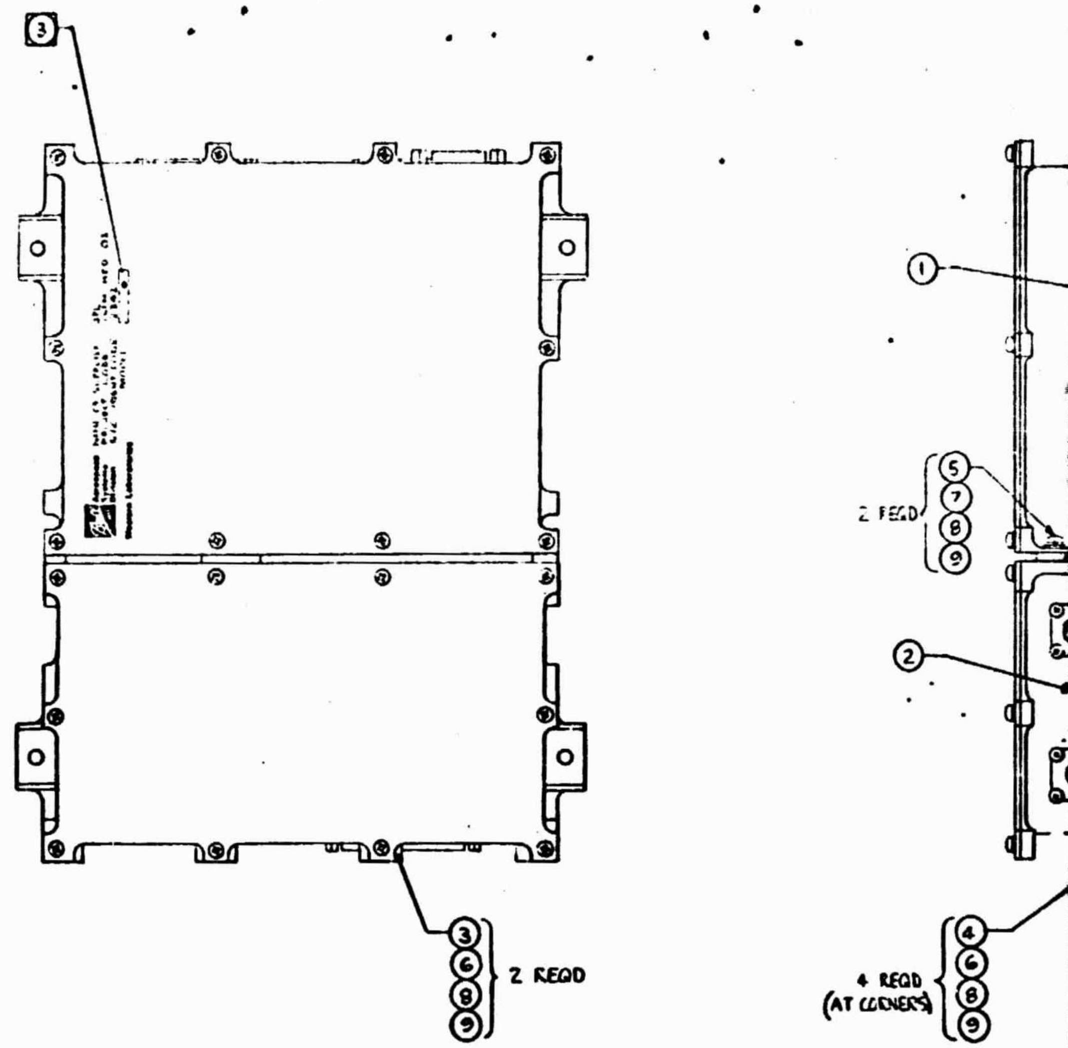
SERVO ELECTRONICS, ANALOG
(SCH 200059)

DIGITAL (SCH 200061)

LOW VOLTAGE POWER SUPPLY & HEATER
(SCH 200050)

RF SUPPLY (SCH 200053)

4 | 3



NOTES: UNLESS OTHERWISE SPECIFIED

1. TORQUE ALL SCREWS (INSTALLED AT THIS ASSY) TO 5.00 ± .25 IN LBS.
2. ALL HARDWARE TO BE NON-MAGNETIC AND INSTALLED WITH DE-MAGNETIZED TOOLS.
3. MARK THE FOLLOWING INFO PER S40111, CLASS III, TYPE II, USING ITEMS 11 & 12. COAT WITH ITEM 13 PER S43025 CLASS V TYPE I CURE A OR B. IN AREA DIRECTLY BESIDE "MODEL" MARK:
   FOR ENGINEERING MODEL (-01), SERIAL #1, MARK "EM".
   FOR FLIGHT MODEL (-02), SERIAL # 2, MARK "FM".

FOLDOUT FRAME

FLIGHT MODEL	-02	
ENGINEERING MODEL	-01	
	DASH NO.	WHERE NO.

4 | 3

PARTS EXPLOSION

REVISIONS

SYM	ZONE	REV	DESCRIPTION	BY	CK	DATE	APPROVAL

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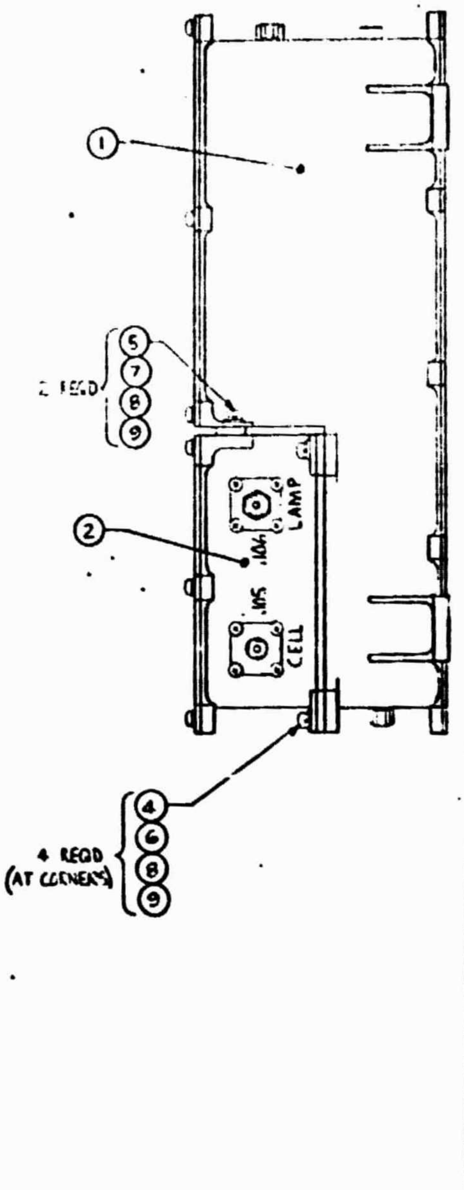

-02	-01	PART NO.	SPECIFICATION	NOMENCLATURE OR DESCRIPTION	ELEC REF DES	CODE IDENT	ZONE	ITEM NO
REF	REF		S43028	COATING SPEC				15
REF	REF		S40111	MARKING SPEC				14
AR	AR	CE-1155 A/B	CONAP	CONATHANE				13
AR	AR	50000 SERIES	WORNOW PROCESS PAINT CO	CATALYST #9				12
AR	AR	50002 SERIES		CAT-L-INK, EPOXY, WHITE				11
1	—	200057-02		RF ASSY				10
8	8	MS35338-135		WASHER, LOCK, CRES, #4				9
8	8	MS51957-15		SCREW, PAN HD, CRES, 4-40 x 3/8 LG				8
2	2	5605-11	SEASTROM	SHOULDER WASHER, KEL F				7
6	6	5605-1	SEASTROM	SHOULDER WASHER, KEL F				6
2	2	200351-13		PAD, ISOLATION				5
4	4	200351-12		PAD, ISOLATION				4
2	2	200351-11		PAD, ISOLATION				3
—	1	200057-01		RF ASSY				2
1	1	200056-01		ELECTRONICS ASSY				1

LIST OF MATERIALS

QTY REQD PER NOTED ASSY

CONFIGURATION

INTERPRET THIS DRAWING PER STANDARDS IN MIL-D-...

DIMENSIONS ARE IN INCHES

TOLERANCES ON DECIMALS / ANGLES

Ball Brothers Research Corporation

TITLE: VECTOR HELIUM MAGNETOMETER

FLIGHT MODEL

SIZE D | CODE IDENT NO 13126 | DWG NO 200036

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Aerospace Systems Division · Western Laboratories

W L-4-5-A (1-78)

ENGINEERING ORDER

DIST CODE 010 A · RELEASED JUN 1 6 1981

DRAWING TITLE	JOB NO.	CODE IDENT NO.	
VECTOR HELIUM MAGNETOMETER	2920	13126	EO — 200036 NC-1

TYPE OF EO	DISPOSITION OF PARTS			
☐ CHANGE	☒ USE	ORIG GAUGHEN DATE 6/9/81	NEXT ASSY FINAL	EFFECTIVITY
☐ VARIANCE	☐ REWORK	CHECK WPB 6-10-81	MODEL NO.	SN 1 & UP
☐ SUPERSEDING	☐ SCRAP	ENGR		
☐ NOTED	☐ NOTED BELOW	PM D. D. A. 6-10-81	OTHER DWG AFFECTED NONE	ECP
		APPR 6-11-81		
		CUSTOMER WPB 6-15-81		SHT 1 OF 1

DESCRIBE CHANGE AND GIVE REASON: CHANGE FROM CONATHANE TO SOLITHANE — OUTGASSING

CHANGE NOTE 3

FROM

" MARK --- $43028 CLASS V -- "

TO

" MARK --- $43028 CLASS II -- "

CHANGE ITEM 13

FROM

CE-1155 A/B, CONAP, CONATHANE

TO

C113-300, $43028, SOLITHANE

QTY	ER NOTED ASSY	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	CODE	ZONE	ITEM NO.

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Aerospace Systems Division Western Laboratories

ENGINEERING ORDER

W L-4-5-A (1-78)

DIST CODE 010A RELEASED [illegible]

DRAWING TITLE	JOB NO.	CODE IDENT NO.	
VECTOR HELIUM MAGNETOMETER	2920	13126	EO — 200036 NC-2

TYPE OF EO	DISPOSITION OF PARTS			
CHANGE	☐ USE	ORIG GAUGHEN DATE 7/7/81	NEXT ASSY FINAL	EFFECTIVITY SN 1 & UP
VARIANCE	☒ REWORK	CHECK WPBS 7-20-81	MODEL NO.	
SUPERSEDING	☐ SCRAP	ENGR [signature] 7/16/81		
NOTED	☐ NOTED BELOW	PM [signature] 7-20-81	OTHER DWG AFFECTED NONE	ECP
		APPR [signature]		
		CUSTOMER WPBS 7-20-81		SHT 1 OF 1

DESCRIBE CHANGE AND GIVE REASON: CUSTOMER REQUEST — TO PROVIDE PROTECTION AND EMI SHIELDING FOR TEST CONNECTOR (J03)

CHANGE FD AT ZONE 4D

FROM

TO

ADD NOTE " 4 TORQUE TO 2.0 ±.25 IN LBS."

CHANGE NOTE 1

FROM: 1. TORQUE ALL SCREWS (INSTALLED AT THIS ASSY) TO 5.00 ±.25 IN LBS

TO: 1. TORQUE TO 5.00 ± .25 IN LBS.

ADD " 1 " TO HARDWARE CALLOUT 8, F/D, 3 PL AT ZONES 3B, 2B, 2C

ADD

-02	-01	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	CODE IDENT	ZONE	ITEM NO.
2	2	MS51957-2	MS51957	SCREW, PAN HD, CRES, 2-56 x 3/16 LG				19
2	2	NAS620C2L	NAS620	WASHER, FLAT, CRES, #2				18
2	2	MS35338-134	MS35338	WASHER, LOCK, CRES, #2				17
1	1	200364-11		EMI SHIELD, CONNECTOR (J03)				16

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ENGINEERING ORDER

W L-4-5-A (1-78)

DIST CODE 010A — RELEASED NOV 19 1981

DWG	JOB NO.	CODE IDENT NO.	EO
VECTOR HELIUM MAGNETOMETER	2920	13126	EO — 200036NC-3

TYPE OF EO	DISPOSITION OF PARTS		NEXT ASSY	EFFECTIVITY
CHANGE	☐ USE	ORIG WPBJ DATE 11-18-81	NEXT ASSY FINAL	SN 1 & UP
VARIANCE	☒ REWORK	CHECK	MODEL NO.	
SUPERSEDING	☐ SCRAP	ENGR [illegible] 11-18-81		
NOTED	☐ NOTED BELOW	APPR [illegible] 11/18/81	OTHER DWG AFFECTED	ECP
		CUSTOMER WPBJ 11-18-81		SHT 1 OF 1

DESCRIBE CHANGE AND GIVE REASON:

1. IN LIST OF MATERIALS CHANGE ITEM 6 QTY
   FROM: $\boxed{6 \mid 6}$ TO: $\boxed{8 \mid 8}$
2. DELETE ITEM 7
3. IN ZONE 2C CHANGE
   FROM: 5 7 8 9 TO: 5 6 8 9

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QTY REQD			USED ASSY	PART NO.	SPECIFICATION		DESCRIPTION	ELECT REF DES	CODE IDE.	ZONE	ITEM NO.
										1	

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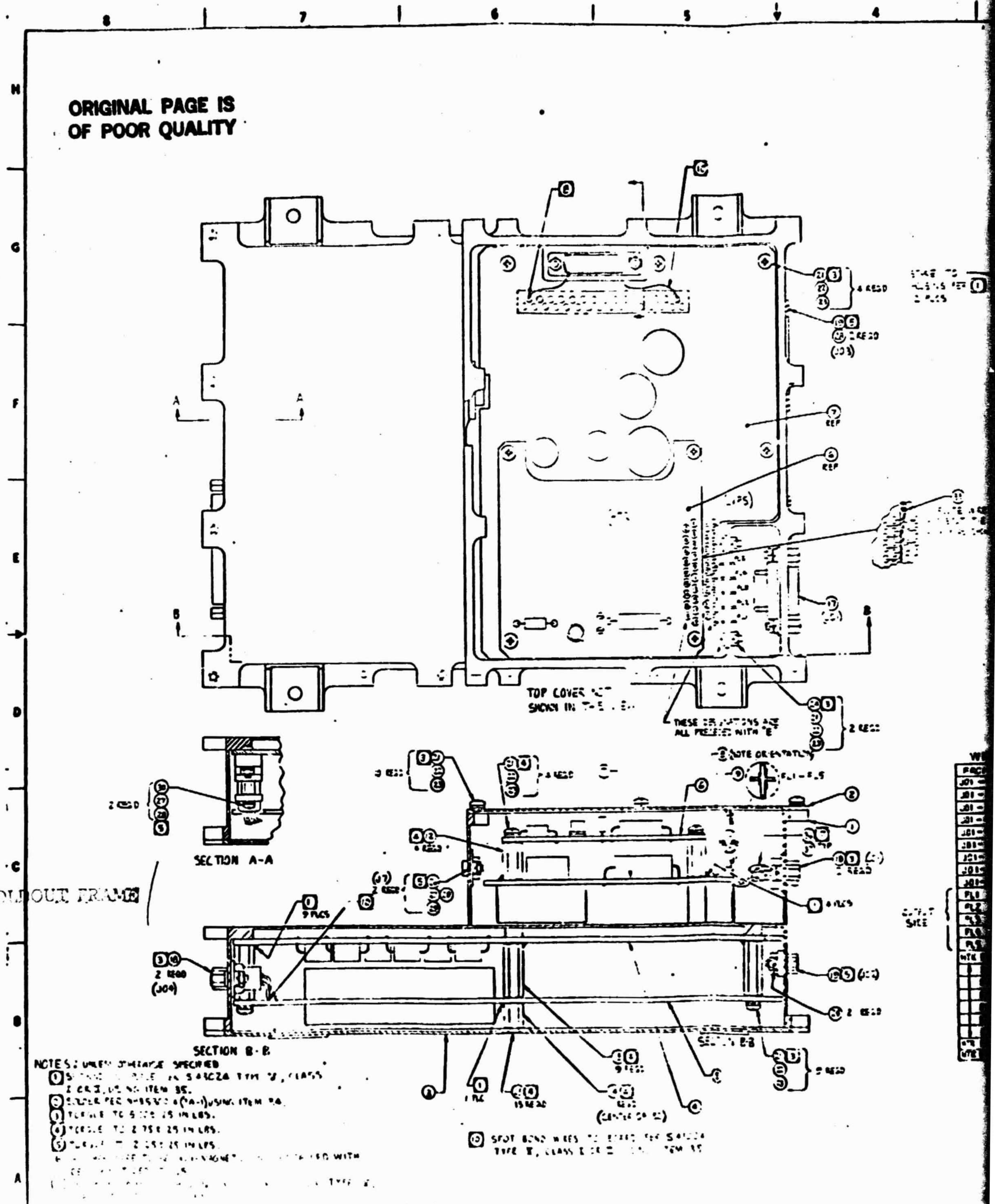

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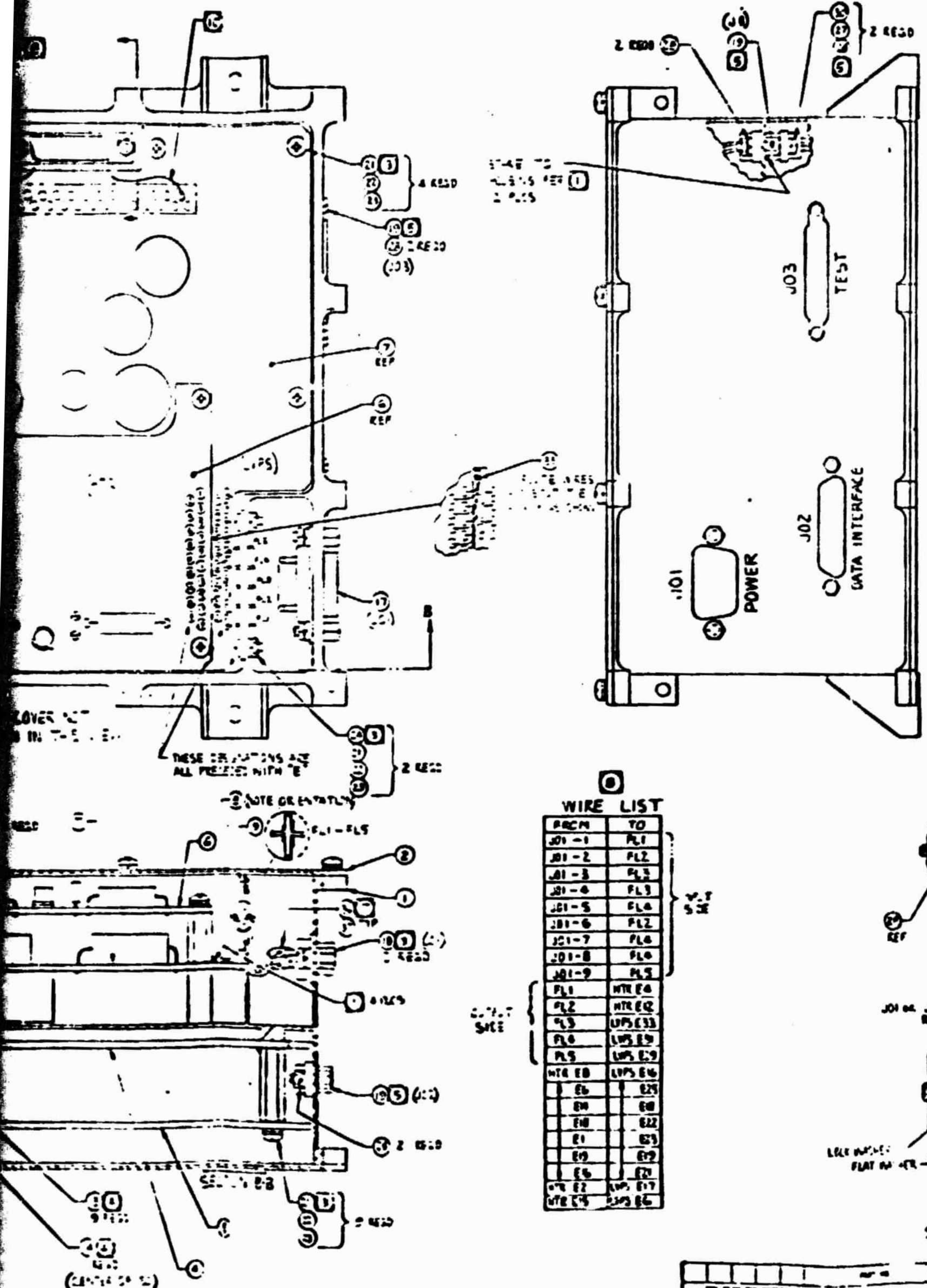

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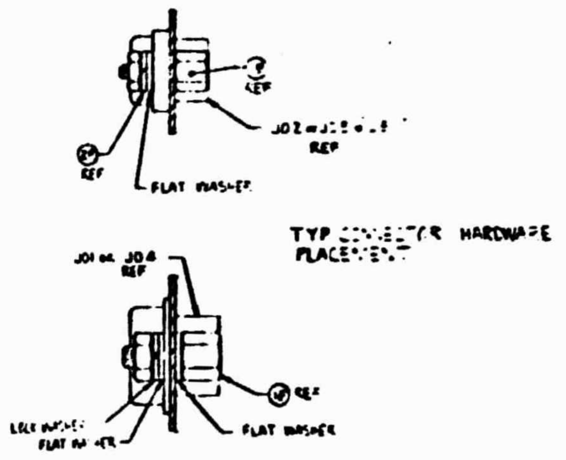
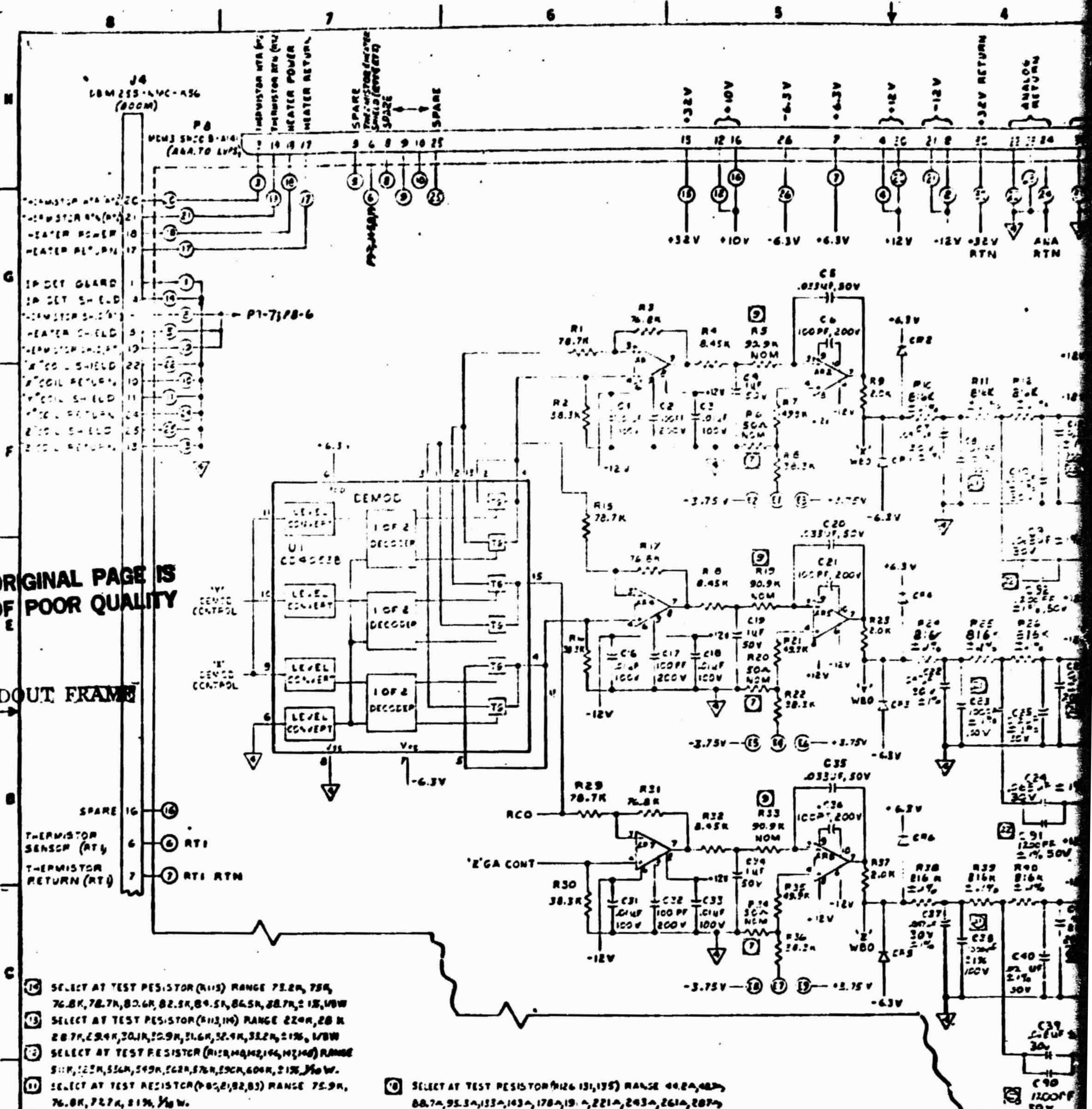
WIRE LIST

FROM	TO
J01-1	FL1
J01-2	FL2
J01-3	FL3
J01-4	FL3
J01-5	FL4
J01-6	FL2
J01-7	FL4
J01-8	FL4
J01-9	FL5
FL1	HTR E4
FL2	HTR E12
FL3	LVPS E33
FL4	LVPS E9
FL5	LVPS E29
HTR E8	LVPS E16
E6	E25
E14	E18
E18	E22
E1	E23
E19	E19
E6	E21
HTR E2	LVPS E17
HTR E15	LVPS E6



SEE PL 200056



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(14) SELECT AT TEST RESISTOR (R115) RANGE 73.2K, 75K, 76.8K, 78.7K, 80.6K, 82.5K, 84.5K, 86.5K, 88.7K, ±1%, 1/8W

(13) SELECT AT TEST RESISTOR (R113,114) RANGE 22.4K, 28K, 28.7K, 29.4K, 30.1K, 30.9K, 31.6K, 32.4K, 33.2K, ±1%, 1/8W

(12) SELECT AT TEST RESISTOR (R128,140,142,144,143,145) RANGE 511K, 523K, 536K, 549K, 562K, 576K, 590K, 604K, ±1%, 1/10 W.

(11) SELECT AT TEST RESISTOR (R80,81,82,83) RANGE 75.9K, 76.8K, 78.7K, ±1%, 1/10 W.

(10) SELECT AT TEST RESISTOR (R61) RANGE 78.7K, 82.5K, 86.6K, 90.9K, 95.3K, 100K, 105K, 110K, 115K, 121K, ±1%, 1/10 W.

(9) SELECT AT TEST RESISTOR (R5,19,33) RANGE 64.9K, 698K, 75K, 80.6K, 84.5K, 90.9K, 95.3K, 100K, 105K, 110K, ±1%, 1/10 W.

(8) SELECT AT TEST RESISTOR (R78) RANGE 15.8K, 16.2K, 16.5K, 16.9K, 17.4K, ±1%, 1/10 W.

(7) SELECT AT TEST RESISTOR (R6,20,34) RANGE 10Ω, 20Ω, 30Ω, 40Ω, 50Ω, 60Ω, 70Ω, 80Ω, ±1%, 1/10 W.

(6) SELECT AT TEST CAPACITOR (C85,86) .47μF, .56μF, .68μF, .82μF, 1μF, ±10%.

(5) SELECT AT TEST CAPACITOR (C84) RANGE [illegible]

ALL OPERATIONAL AMPLIFIERS ARE [illegible]

[illegible]

(18) SELECT AT TEST RESISTOR (R126,131,135) RANGE 44.2Ω, 48.7Ω, 88.7Ω, 95.3Ω, 133Ω, 143Ω, 178Ω, 191Ω, 221Ω, 243Ω, 261Ω, 287Ω, 307Ω, 332Ω, 357Ω, 383Ω, 392Ω, 432Ω, 442Ω, 487Ω, 523Ω, 576Ω, 619Ω, 665Ω, 698Ω, 715Ω, 750Ω, 768Ω, 806Ω, 845Ω, 866Ω, 887Ω, 909Ω, 931Ω, 951Ω, 973Ω, 1.02K, 1.05K, 1.07K, 1.1K, 1.15K, 1.18K, 1.24K, 1.27K, 1.33K, 1.37K, 1.4K, 1.43K, 1.47K, 1.5K, 1.54K, 1.58K, 1.62K, 1.69K, 1.74K, 1.78K, ±1%, 1/8 W.

(17) SELECT AT TEST RESISTOR (R128,125,127) RANGE 357Ω, 383Ω, 715Ω, 768Ω, 1.07K, 1.15K, 1.43K, 1.58K, 1.78K, 1.96K, 2.15K, 2.32K, 2.49K, 2.74K, 2.8K, [illegible]

(16) SELECT AT TEST RESISTOR [illegible]

(15) SELECT AT TEST RESISTOR [illegible]

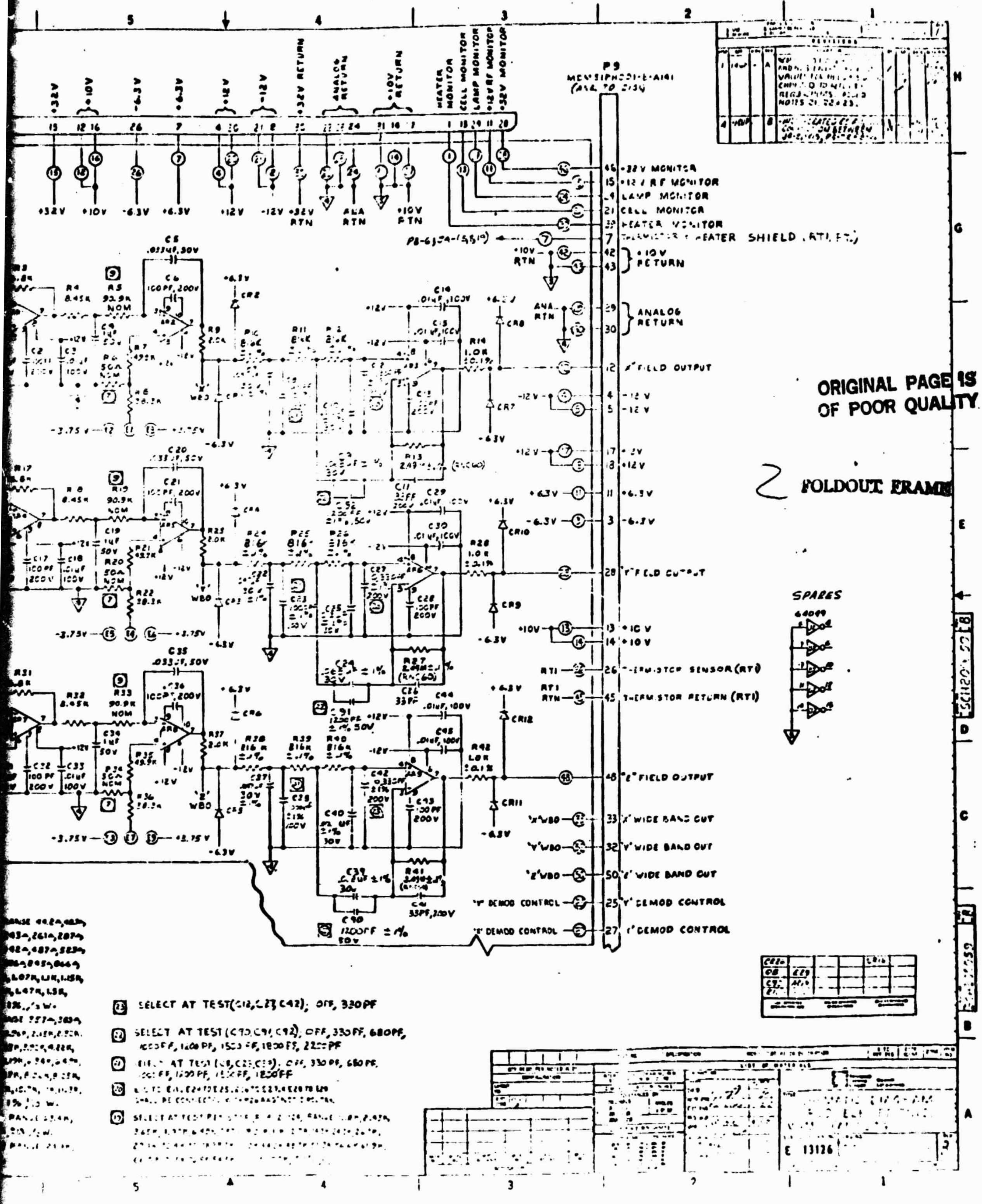
(23) SELECT AT TEST (C12, C27, C42); OFF, 330PF

(22) SELECT AT TEST (C90, C91, C92); OFF, 330PF, 1000PF, 1200PF, 1500PF, 1800PF, 2200PF

(21) SELECT AT TEST (C8, C23, C38); OFF, 330PF, 680PF, 1000PF, 1200PF, 1500PF, 1800PF

(20) [illegible] SHALL BE CONNECTED [illegible]

(19) SELECT AT TEST RESISTOR [illegible]



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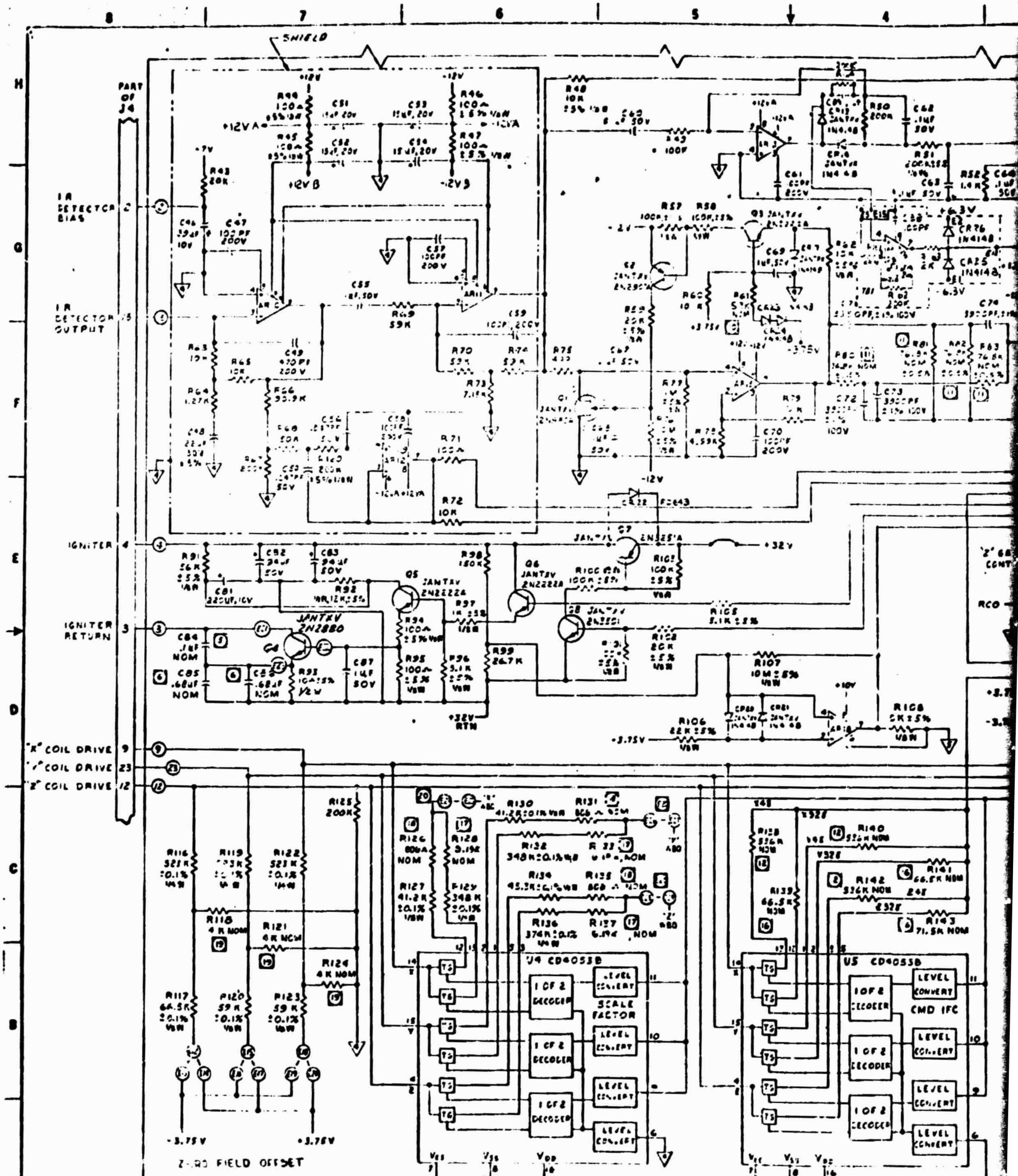

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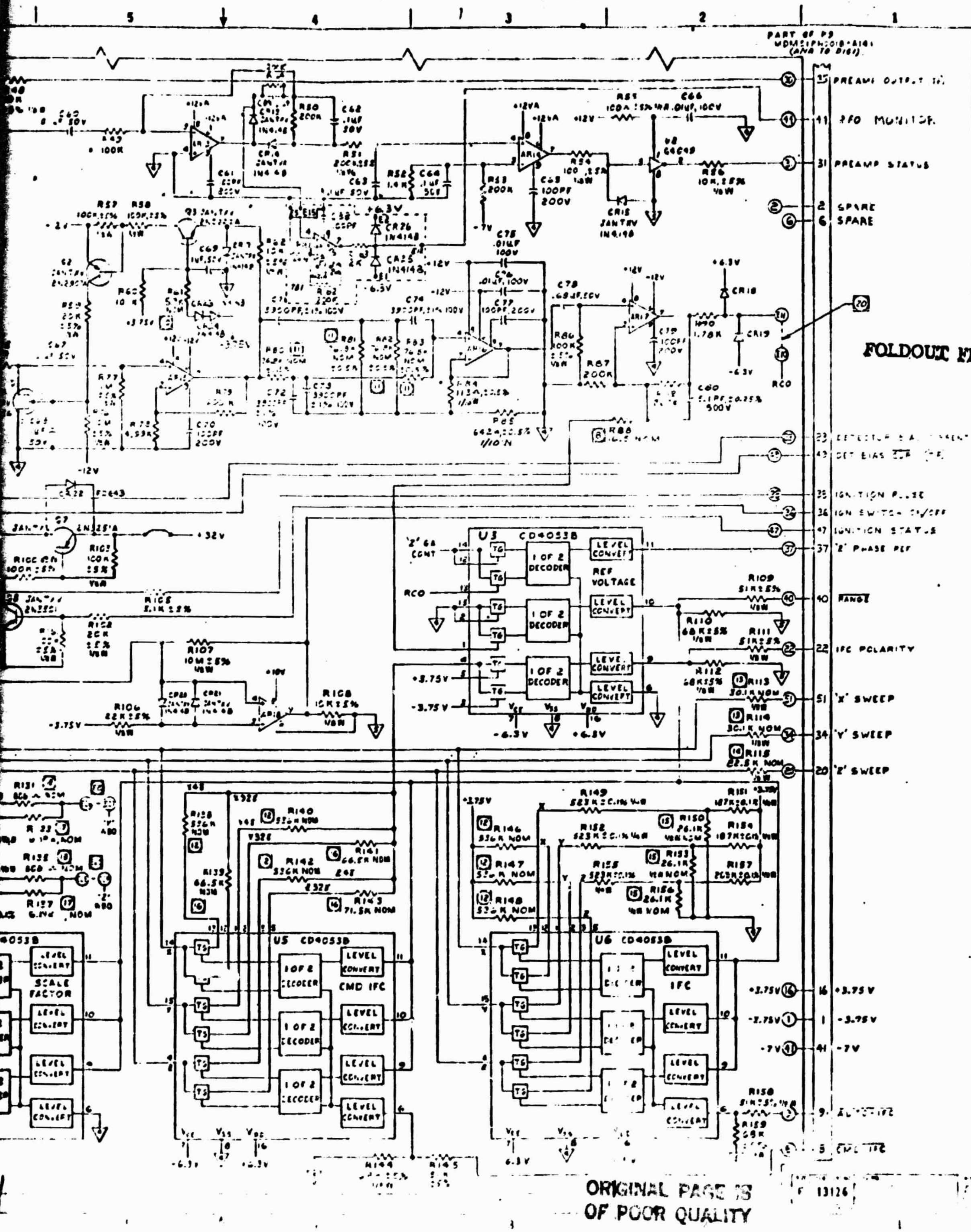

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Aerospace Systems Division — Western Laboratories

ENGINEERING ORDER

DIST CODE 010A — RELEASED MAY 20 '81

DRAWING TITLE	JOB NO	CODE IDENT NO	
SCHEMATIC DIAGRAM ANALOG ASSEMBLY VHM	2920	13126	EO — SCH200059 REV. B-1

TYPE OF EO	DISPOSITION OF PARTS			
CHANGE	☒ USE	ORIG Jaramillo DATE 5-20-81	NEXT ASSY 200056	EFFECTIVITY
VARIANCE	☐ REWORK	CHECK 20 MAY 81		1 & UP
SUPERSEDING	☐ SCRAP	ENGR	MODEL NO. 200036-01	
NOTED	☐ NOTED BELOW	PM 5-20		ECP
		APPR	OTHER DWG AFFECTED PL 200059	
		CUSTOMER WPGS 5-20-81		SHT 1 OF 1

DESCRIBE CHANGE AND GIVE REASON:

PAGE 2, ZONE 3-F

CHANGE CALLOUT ON R85 TO:

R85
1.0K ±0.5%
1/10 W

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QTY REQ	NOTED ASSY	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES		ZONE	ITEM NO

Aerospace Systems Division
Western Laboratories

ENGINEERING ORDER

DIST CODE 010A
RELEASED

DRAWING TITLE	JOB NO.	CODE IDENT NO.	
SCHEMATIC DIAGRAM, SERVO ELECTRONICS VHM (ANALOG)	2920	13126	EO — SCH 200059 B-2

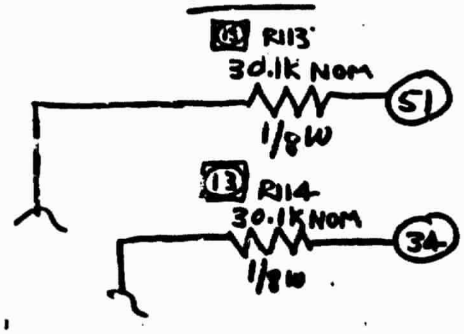
TYPE OF EO	DISPOSITION OF PARTS				
CHANGE	☐ USE	ORIG GAUGHEN	DATE 7/8/81	NEXT ASSY 200059	EFFECTIVITY SN 1 & UP
☐ VARIANCE	☒ REWORK	CHECK WPBS	7-20-81	MODEL NO.	
☐ SUPERSEDING	☐ SCRAP	ENGR			
		PM	7-20-81		
☐ NOTED	☐ NOTED BELOW	APPR	QA 7/17/81	OTHER DWG AFFECTED 200059 PL200059	ECP
		CUSTOMER WPBS	7-20-81		SHT 1 OF 1

DESCRIBE CHANGE AND GIVE REASON: ENGINEERING REQUEST, PARTS AVAILABILITY

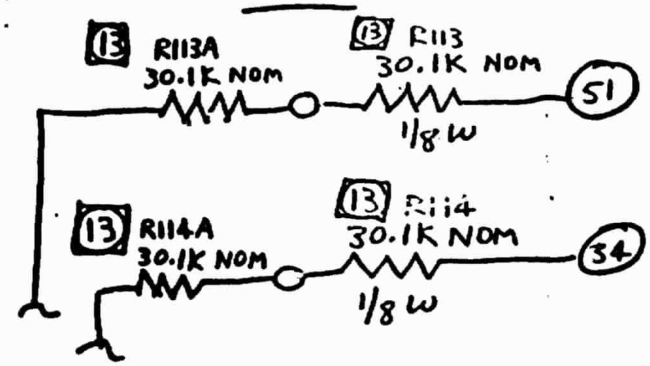
ADD RESISTOR R113A IN SERIES WITH R113; ADD RESISTOR R114A IN SERIES WITH R114

SHEET 2
ZONE 2D CHANGE

FROM



TO



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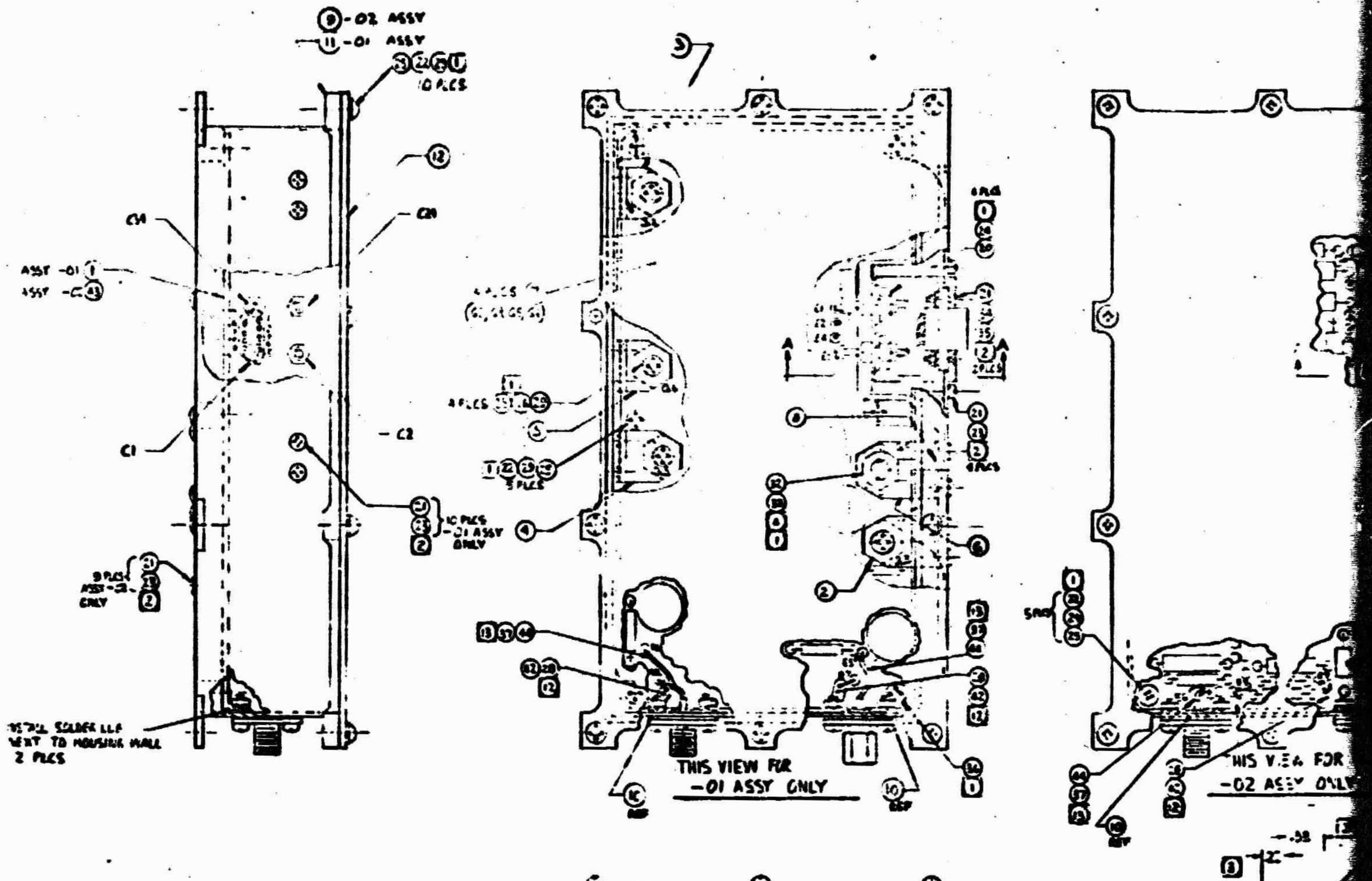

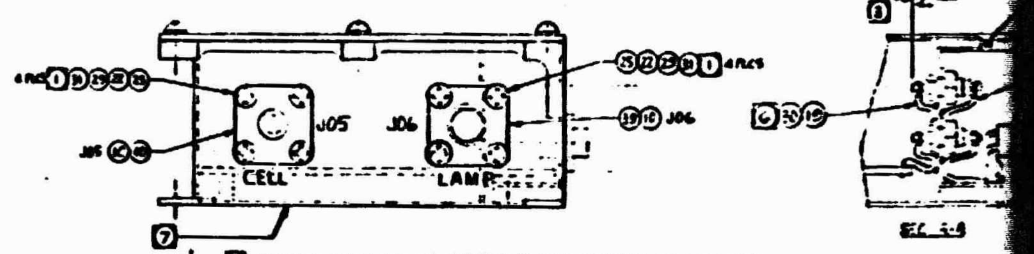

WIRE LIST

FROM	TO	WIRE
C1	C1	26 AWG
C2	C3	
C3	C24	
C4	C34	26A-IG
C1	PIN 5 OF P7	WIRES
C2	PIN 2 OF P7	COME WITH
C24	PIN 1 OF P7	CONNECTOR
C34	PIN 6 OF P7	P7

14 LEAD TO J05 & J06 TO BE 2.0 IN MIN AT ASSY. SHORTEN TO MINIMUM PRACTICAL LENGTH AFTER TEST.

13 MODIFY COAX WIRE PER DETAIL B.

12 MOUNT TO CONNECTOR HARDWARE CLOSEST TO PC BOARD.

11 CUT UNUSED CONNECTOR LEADS 3, 4, 7, 8, 9, 12 & 16 FROM BACK OF CONNECTOR.

8. ALL HARDWARE TO BE NON-MAGNETIC AND INSTALLED WITH DE-MAGNETIZED TOOLS.

9. CONFORMAL COAT ALL SOLDER JOINTS PER 84002F CLASS II,

A. FOR SCHEMATIC [illegible] SCH 700053.

7 [illegible] PER [illegible] TYPE III, USING ITEMS 45 & 46.

6 [illegible] CLASS 1 OR 2, USING ITEM 13.

5 SOLDER PER [illegible] ITEM 37

4. [illegible]

3 [illegible] INSTALLATION.

[illegible]

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C-2

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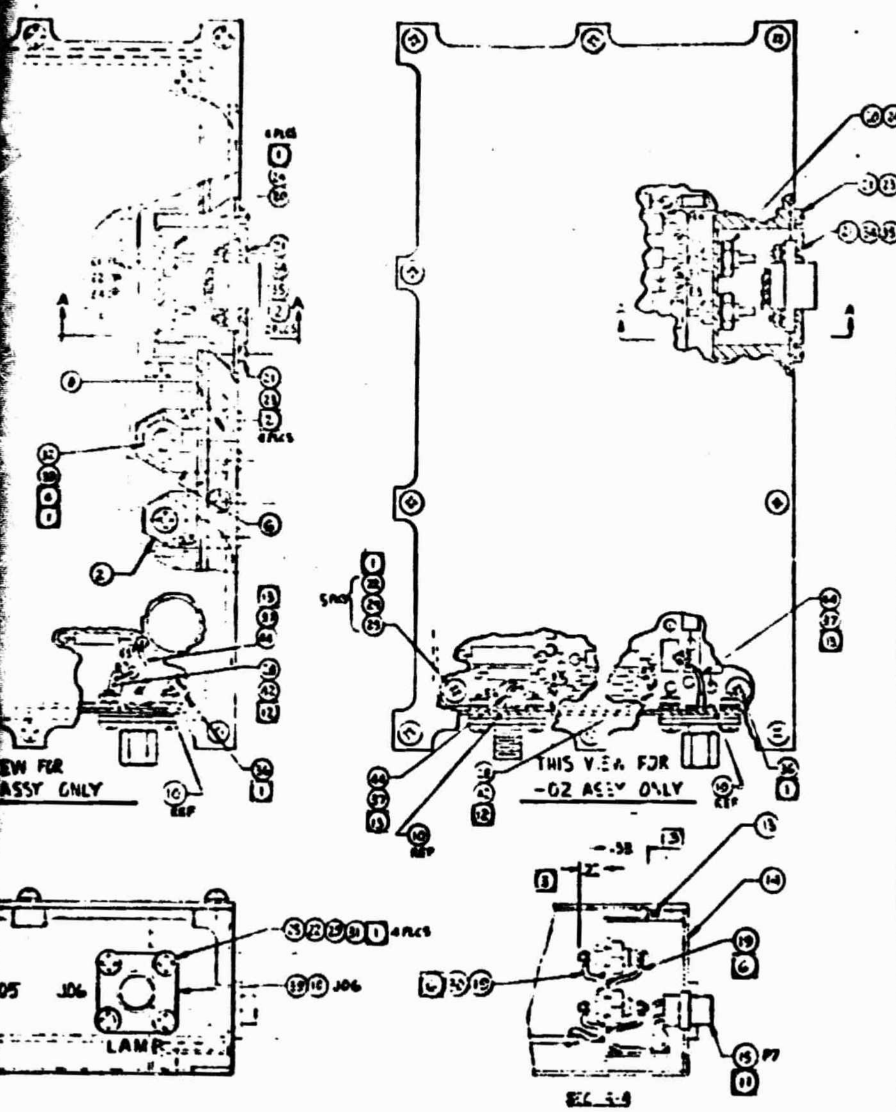
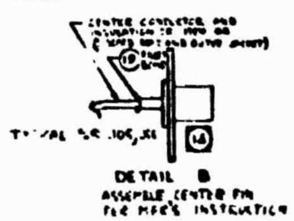




AR	AR	[illegible]	WARNOW PROCESS	CATALYST EPOXY, WHITE		46
AR	AR	[illegible] SERIES	PAINT CO	CATALYST NO. 9		45
AR	AR	[illegible]	ASTROLAB	[illegible] WIRE, ETCHED		44
1	—	200359-01		[illegible] ASSY, RF		43
AR	AR	TYPE S	QQ-W-343	WIRE, BUS 26 AWG		42
REF	REF		S45028	CONFORMAL COAT, SPEC		41
1	1	29[illegible] I	ASTROLAB	JACK ASSY, ISOLATED FLANGE	J05	[illegible]
1	1	29[illegible] I	ASTROLAB	[illegible] ASSY, ISOLATED FLANGE	J06	[illegible]
REF	REF	SCH 200053		SCHEMATIC		[illegible]
AR	AR	Sn 63	QQ-S-571	SOLDER		37
1	1	MS24693-C[illegible]	MS24693	SCREW FLT HD 100° CRES [illegible]		36
2	2	MS35649-224	MS35649	NUT [illegible]		35
2	2	NAS[illegible]	NAS[illegible]	SCREW FLT HD [illegible] CRES [illegible]		34
—	1	NAS[illegible]	NAS[illegible]	WASHER, FLAT #0		33
—	1	NAS[illegible]C10	NAS[illegible]	NUT #0-32 UNF [illegible]		[illegible]
8	8	MS35649-204	MS35649	NUT #4-40 UNC [illegible]		31
AR	42	[illegible] TYPE E	[illegible]	[illegible] ETCHED		30
23	27	MS35338-[illegible]	MS35338	WASHER LOCK SPRING #4		[illegible]
2	2	S[illegible]-3-120	[illegible]	SOLDER LUG, #4, BRASS		[illegible]
AR	AR	C113-300	S49028	[illegible]URETHANE		[illegible]
—	4	MS51957-12	MS51957	SCREW #4-40 [illegible]		[illegible]
23	27	NAS[illegible]C4L	NAS[illegible]	WASHER FLAT #4		[illegible]
4	4	MS35649-2[illegible]	MS35649	NUT #2-[illegible] UNC [illegible]		[illegible]
13	14	MS51957-2	MS51957	SCREW #2-56 UNC [illegible]		23
23	23	MS5[illegible]-15	MS5[illegible]	SCREW #4-40 UNC [illegible]		22
15	16	MS35338-134	MS35338	WASHER LOCK [illegible] #2		21
4	4	MS35338-137	MS35338	WASHER LOCK [illegible] #5		[illegible]
AR	AR	C151	HYSOL	EPOXY PATCH		19
REF	REF	NHB5300.4(3A)		[illegible] SPEC		[illegible]
REF	REF		[illegible]	[illegible] SPEC		17
4	4	[illegible]	[illegible]	[illegible] FILTER [illegible]	[illegible]	[illegible]
1	1	[illegible]-A[illegible]	ITT	CONNECTOR	P7	15
1	1	200246-11		PLATE, MTG-CONNECTOR		14
1	1	20[illegible]-B		GASKET, COVER		13
1	1	20[illegible]224-11		COVER		12
—	1	2[illegible]52-11		HOUSING		11
2	2	20[illegible]-12		[illegible]		[illegible]
1	—	200052-12		HOUSING		[illegible]
—	1	20[illegible]		[illegible]ATE		[illegible]
—	4	2[illegible]79-11		[illegible]ATE		7
—	1	2[illegible]344-11		HEATER [illegible]		[illegible]
—	1	2[illegible]345-4		HEATER [illegible] 06		[illegible]
—	1	20[illegible]-13		HEATER [illegible]		[illegible]
—	1	2[illegible]345-12		HEATER [illegible]		[illegible]
—	1	2[illegible]345-11		[illegible]		[illegible]
—	1	2[illegible]5[illegible]		[illegible]		1

J05 & J06 TO BE 2.0 IN MIN AT ASSY. SHORTEN TO PRACTICAL LENGTH AFTER TEST.

[illegible] COAX WIRE PER DETAIL B.

[illegible] CONNECTOR [illegible] TO PC BOARD.

[illegible] CONNECTOR [illegible] 3, 4, 7, 2, 12 [illegible] FROM [illegible] OF CONNECTOR [illegible] TO BE NON-MAGNETIC AND INSTALLED WITH [illegible] TIES.

[illegible] COAT ALL SCREWS [illegible] S45028 CLASS II, [illegible]

[illegible] SCH 200053.

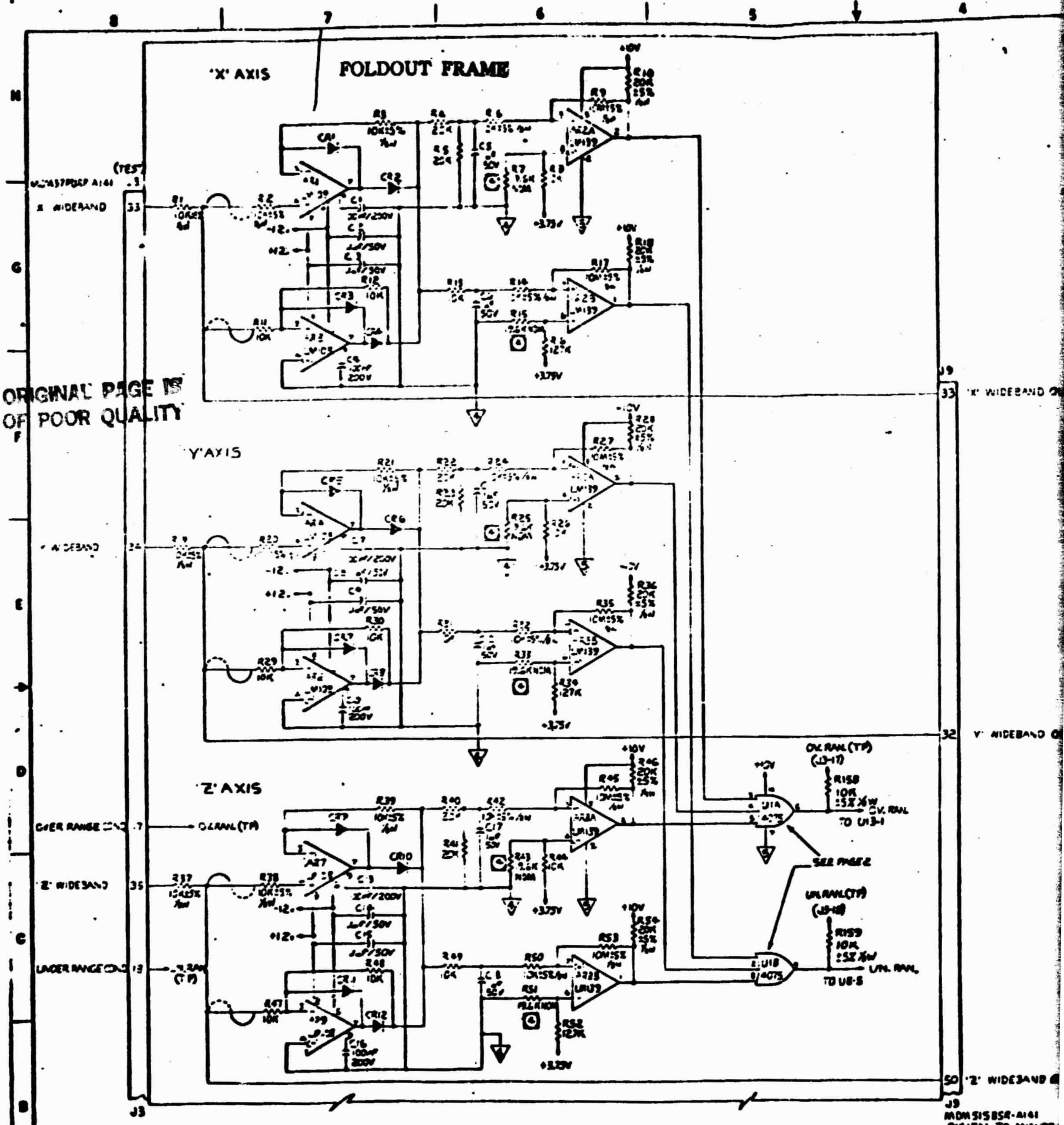
[illegible] PER [illegible] TYPE III, USING ITEMS 45 & 46.

[illegible] USING ITEM 13.

[illegible] ITEM 37

[illegible] INSTALLATION.

F 13126



SELECT AT TEST RESISTOR (R138). RANGE: 6.42K, 6.64K, 6.97K, 5.11K, 5.36K, 11K, 1/8W.

SELECT AT TEST RESISTOR (R141). RANGE: 2.0M - 5.1M ±5% 1/4W.

SELECT AT TEST RESISTOR (R113). RANGE 1/2M 2.43K 3.65K 4.87K 6.04K, 7.32K, 8.45K, 7.65K, 10K, 12.1K ±1% 1/8W.

SELECT AT TEST RESISTOR (R137). RANGE: [illegible]

SELECT AT TEST RESISTORS [illegible] R25, R33, R43 [illegible]

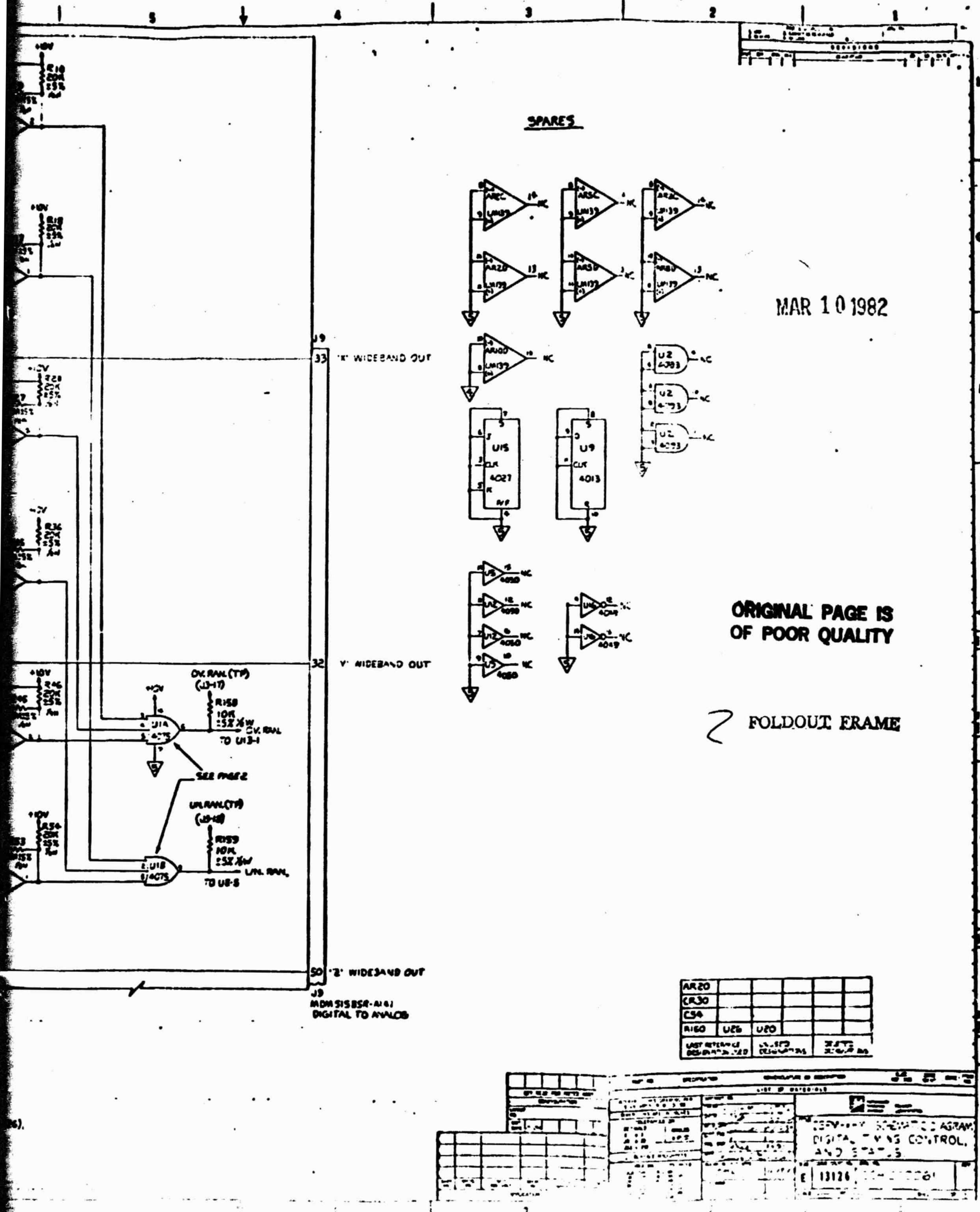
ALL RESISTORS (& REWOUND).

PRESELECT (CR26 & CR27), MATCH V_F TO WITHIN 5% OF EACH OTHER AT 500 mA ±5%.

SELECT AT TEST RESISTOR (R31). RANGE:

SELECT AT TEST RESISTORS (R37, R102, R105, R123, R126). RANGE:

SELECT AT TEST RESISTORS (R10, R104). RANGE:



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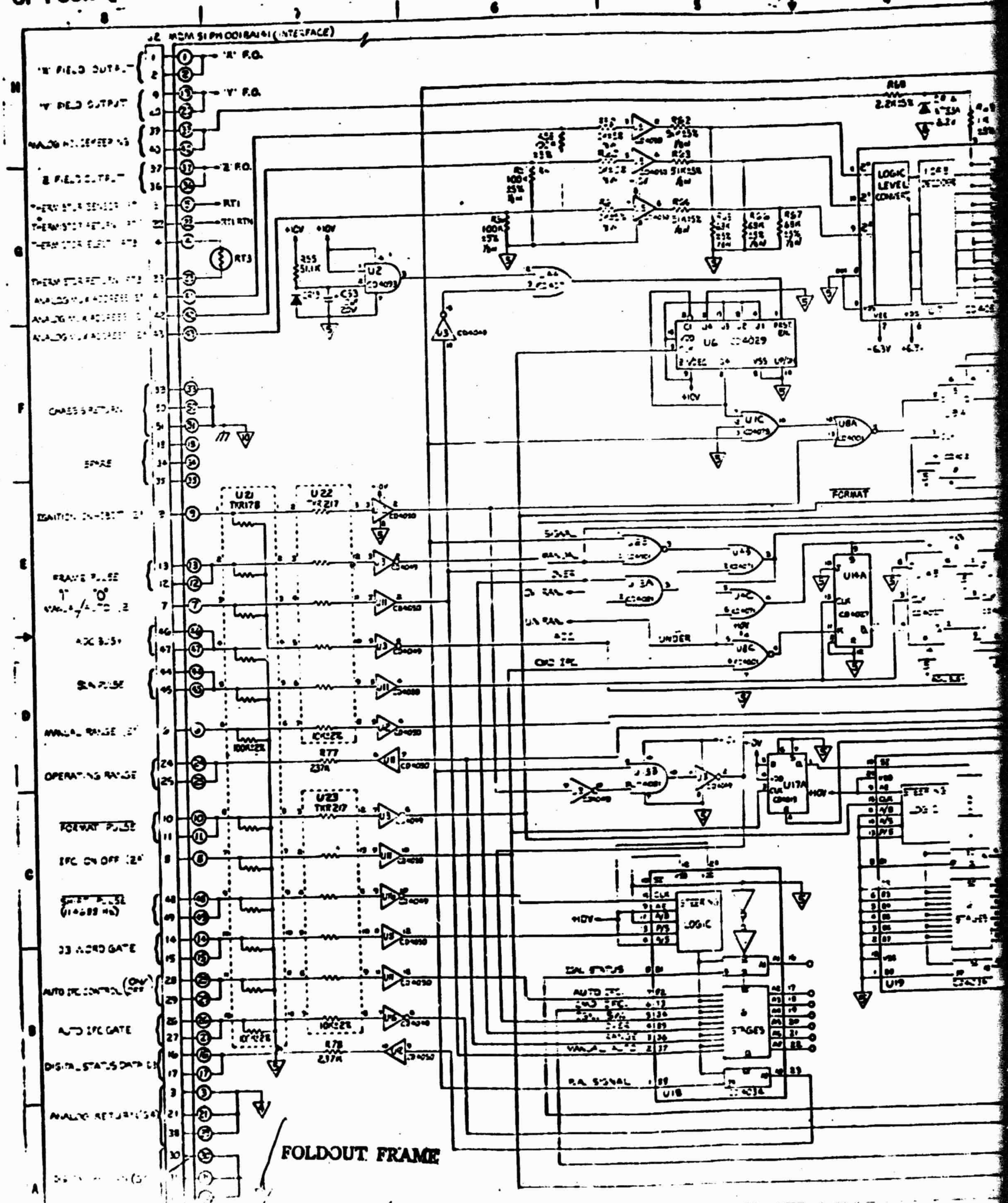

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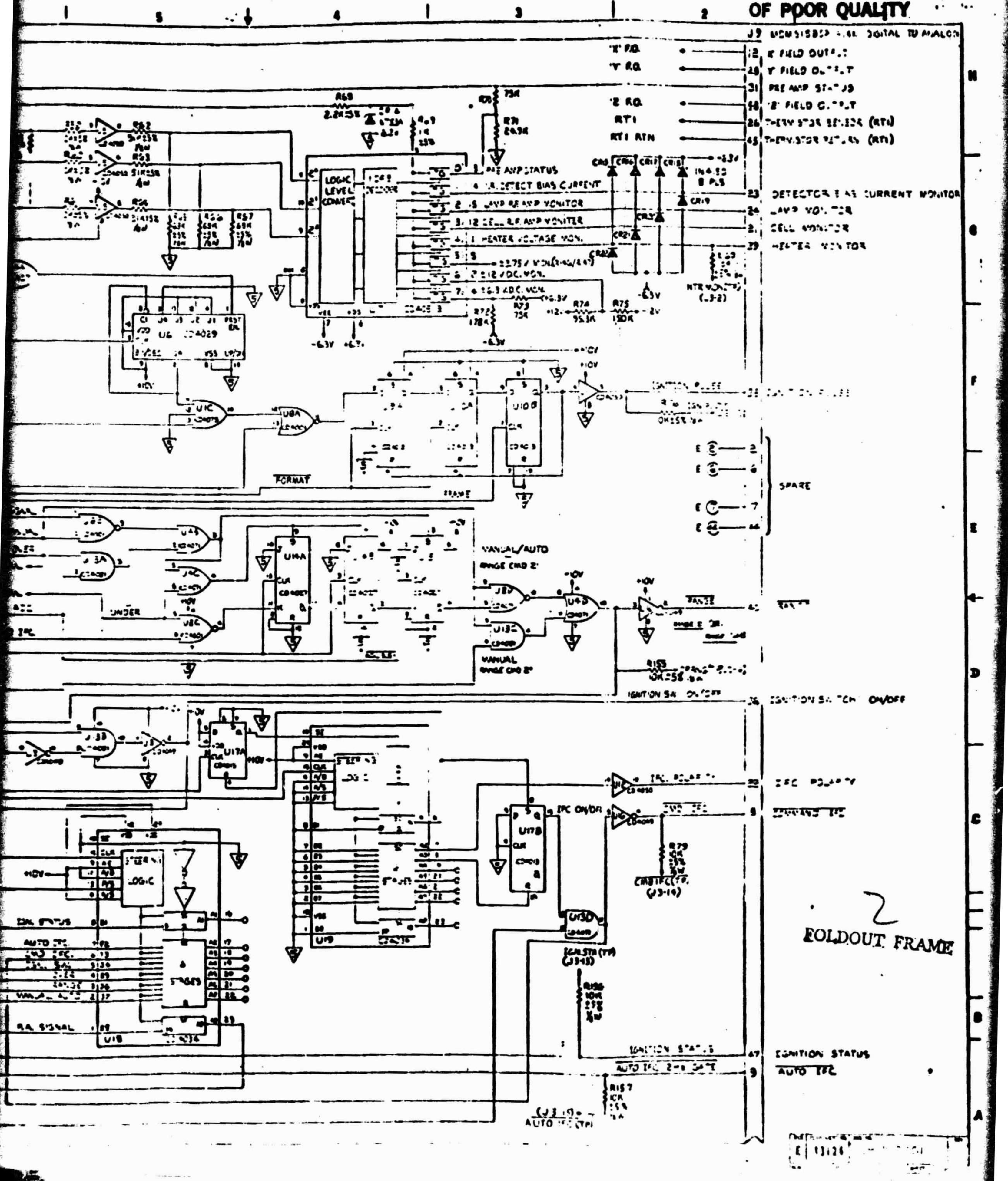

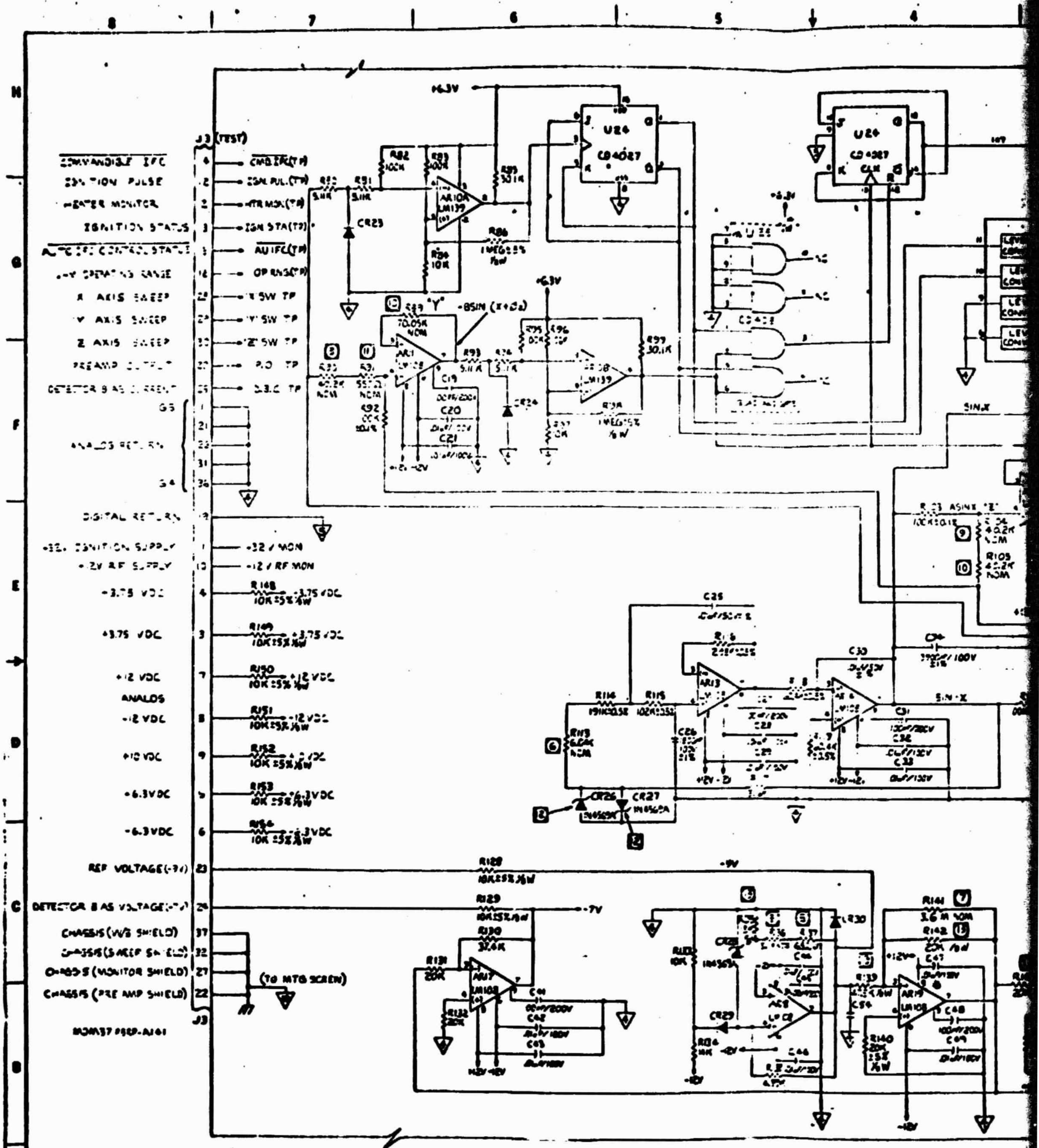

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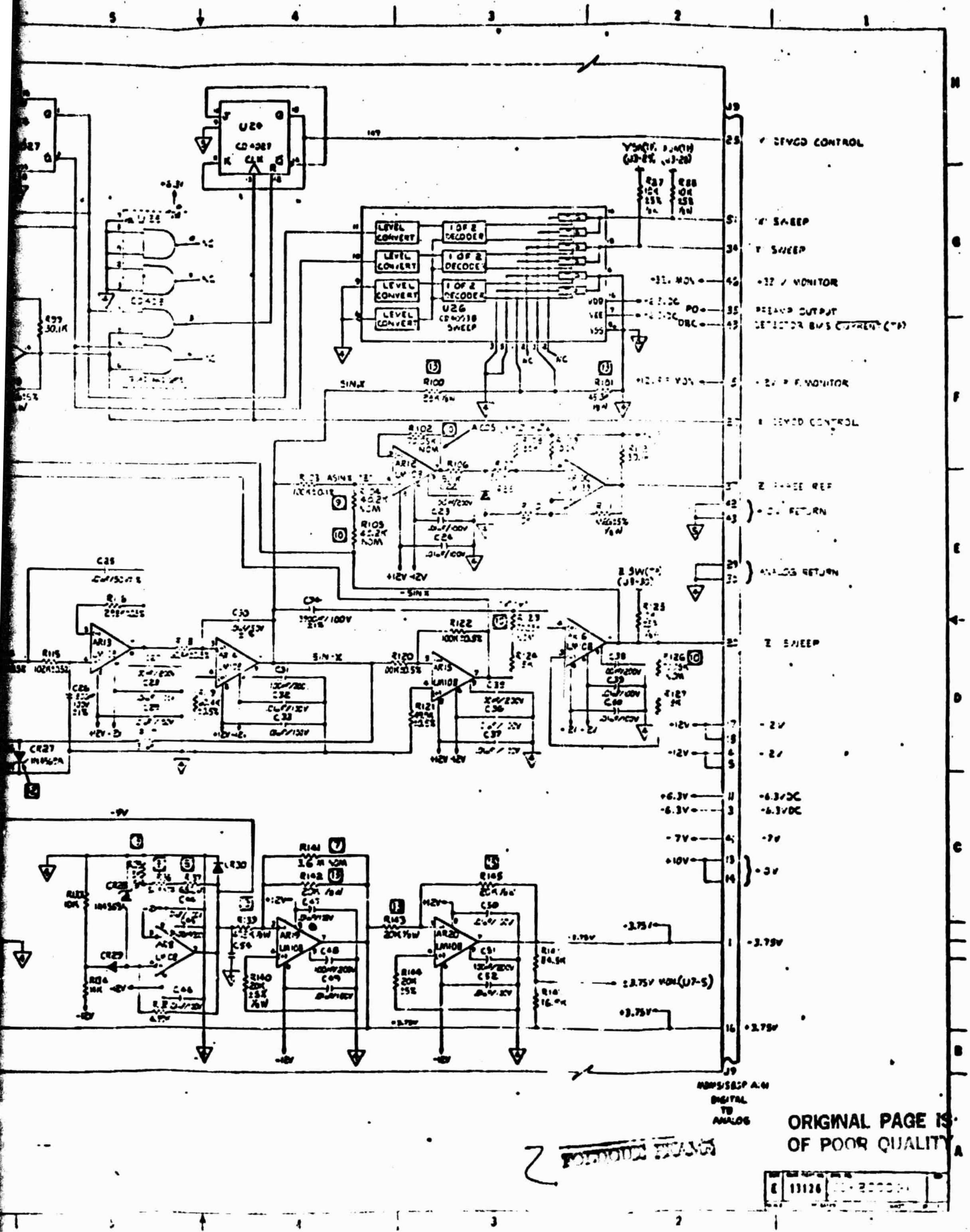

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Ball Aerospace Systems Division — Western Laboratories

W L-4-5-A (1-78)

ENGINEERING ORDER

DIST CODE 010-A RELEASED DEC 01 '80

DRAWING TITLE	JOB NO.	CODE IDENT NO	
SCHEMATIC DIAGRAM SCH200061 DIGITAL TIMING CONTROL & STATUS VHM	2920	13126	EO — SCH200061 NC-1

TYPE OF EO	DISPOSITION OF PARTS		
☒ CHANGE	☒ USE	ORIG PILGRIM DATE 11-26-80	NEXT ASSY 200061
☐ VARIANCE	☐ REWORK	CHECK 11-26-80	MODEL NO. 200036-01
☐ SUPERSEDING	☐ SCRAP	ENGR 11-26-80	OTHER DWG AFFECTED PL200061
☐ NOTED	☒ NOTED BELOW	PM 11-26-80	
		APPR	
		CUSTOMER	

EFFECTIVITY 1 & UP

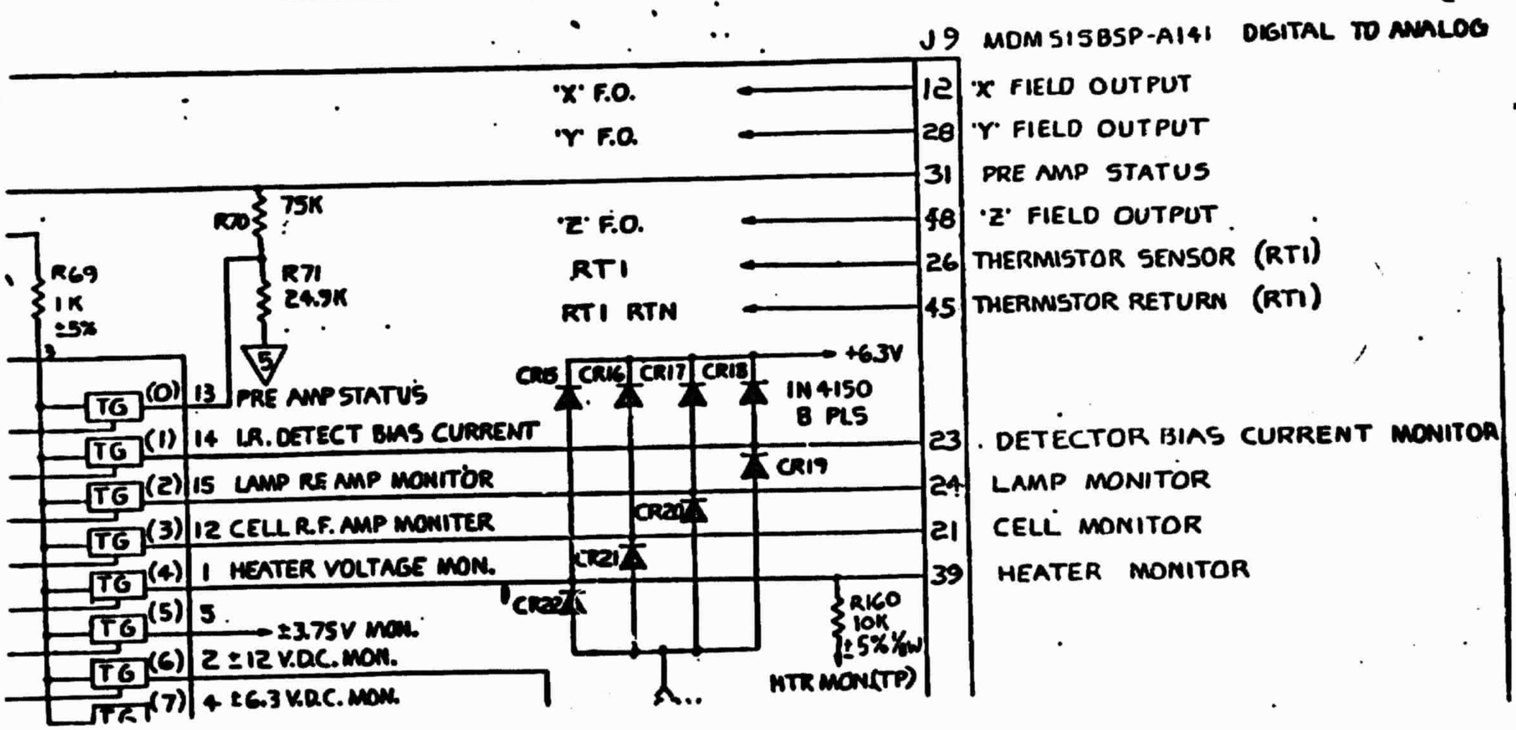
ECP

SHT 1 OF 2

DESCRIBE CHANGE AND GIVE REASON:

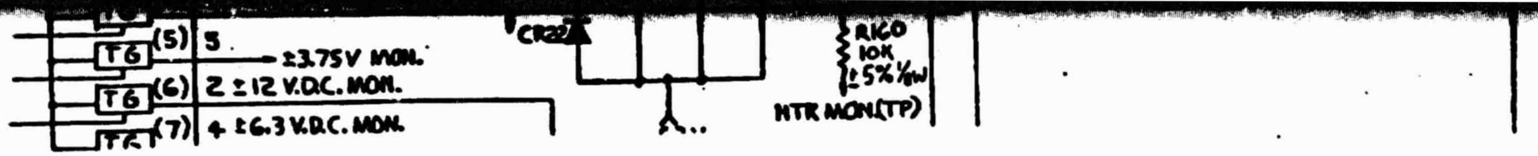
1. PAGE 2, ZONE 2-H

WAS



REASON FOR ABOVE: REQUIRED DESIGN ENGINEERING CHANGES.

QTY REQ'D PER NOTED ASSY	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES



REASON FOR ABOVE: REQUIRED DESIGN ENGINEERING CHANGES.

QTY REQ'D PER NORLD ASSY	PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES		ITEM NO.

Ball Brothers Research Corporation

ENGINEERING ORDER

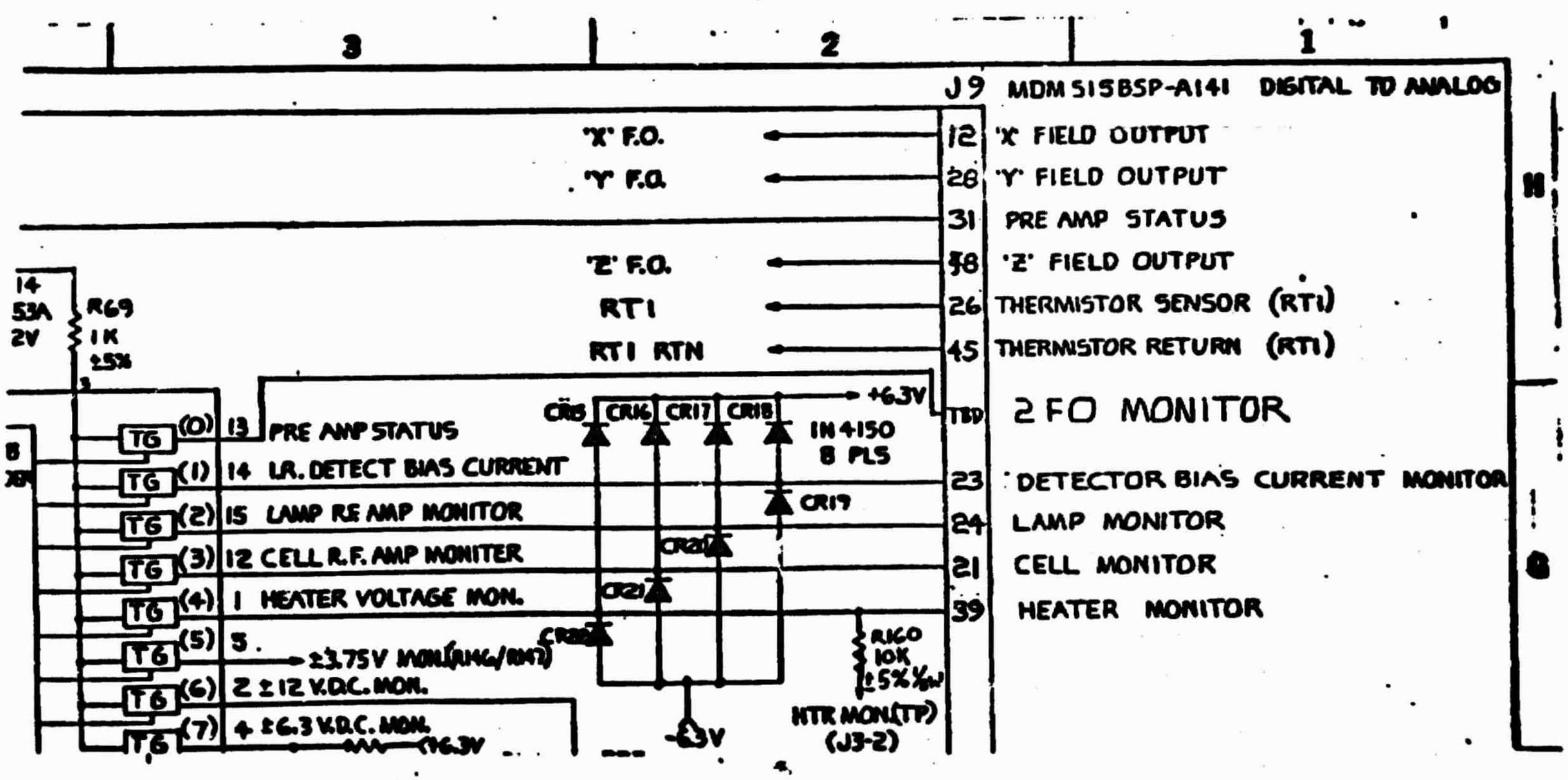
UNIT CODE ____ RELEASED ____

DRAWING TITLE	JOB NO.	CODE IDENT NO.	
SCHEMATIC DIAGRAM SCH200061 DIGITAL TIMING CONTROL & STATUS VHM	2920	13126	EO — SCH200061 NC-1

SHT 2 OF 2

1.(CONT.) PAGE 2 ZONE 2-H

15



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Aerospace Systems Division — Western Laboratories

ENGINEERING ORDER

W L-4-5-A (1-78)
JAN 06 '81

UNIT CODE 010 A

RELEASED

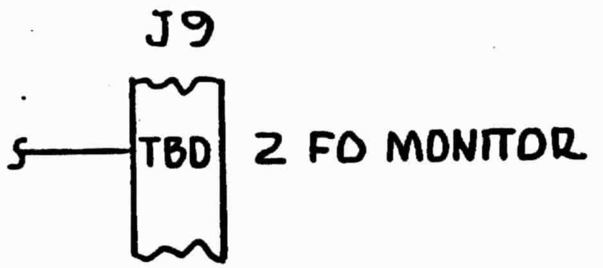
DRAWING TITLE	JOB NO.	CODE IDENT NO.	
SCHEMATIC DIAGRAM DIGITAL TIMING CONTROL & STATUS VHM	2920	13126	EO — SCH 200061 NC-2

TYPE OF EO	DISPOSITION OF PARTS			
[X] CHANGE	[X] USE	ORIG [signature] DATE 12-17-80	NEXT ASSY 200061	EFFECTIVITY 1E UP
[ ] VARIANCE	[ ] REWORK	CHECK [signature] 12-12-80	MODEL NO. 200036-01	
[ ] SUPERSEDING	[ ] SCRAP	ENGR [signature] 12/17/80	OTHER DWG AFFECTED 200061	ECP
[ ] NOTED	[X] NOTED BELOW	PM [signature] 12/17/80		SHT 1 OF 1
		APPR [signature] 12-22-80		
		CUSTOMER		

DESCRIBE CHANGE AND GIVE REASON:

1. SHEET 2 ZONE 2-H

WAS



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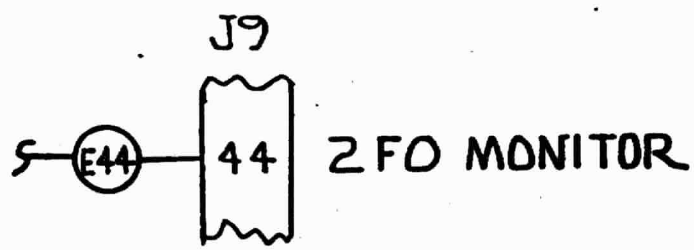
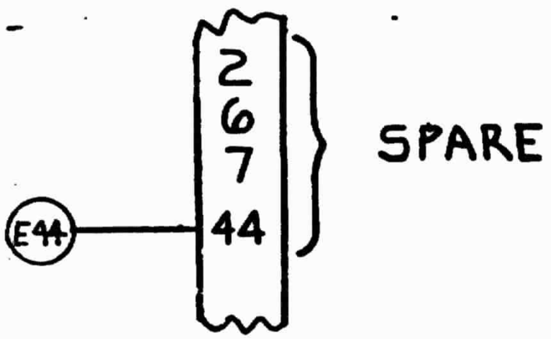
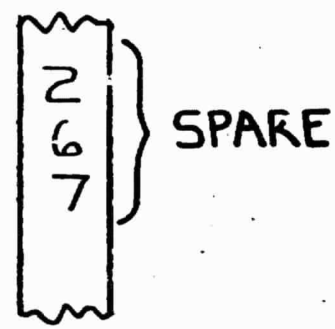


ZONE 2-E





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REASON FOR ABOVE: REQUIRED DESIGN ENGINEERING CHANGES.

QTY. REQ'D PER NOTED ASSY	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	ITEM NO

FOLDOUT FRAME

REASON FOR ABOVE:

QTY REQ PER NOTED ASSY	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	ITEM NO

W L-4-5-A (1-78)

Aerospace Systems Division — Western Laboratories

ENGINEERING ORDER

DIST CODE 010 A

RELEASED ___

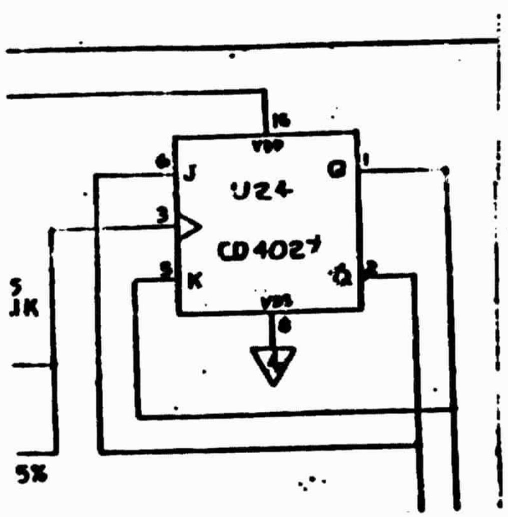
DRAWING TITLE	JOB NO.	CODE IDENT NO.	EO
SCHEMATIC DIGITAL TIMING CONTROL VHM	2920	13126	EO — · SCH200061 NC-3

TYPE OF EO	DISPOSITION OF PARTS			
[X] CHANGE	[X] USE	ORIG JARAMILL DATE 3-20-81	NEXT ASSY 200061	EFFECTIVITY 1 & UP
[ ] VARIANCE	[ ] REWORK	CHECK D.A. 3-20-81	MODEL NO. 200036-01	
[ ] SUPERSEDING	[ ] SCRAP	ENGR		
		PM 3-20-81		ECP
[ ] NOTED	[ ] NOTED BELOW	APPR	OTHER DWG AFFECTED 200061	
		CUSTOMER		SHT 1 OF 1

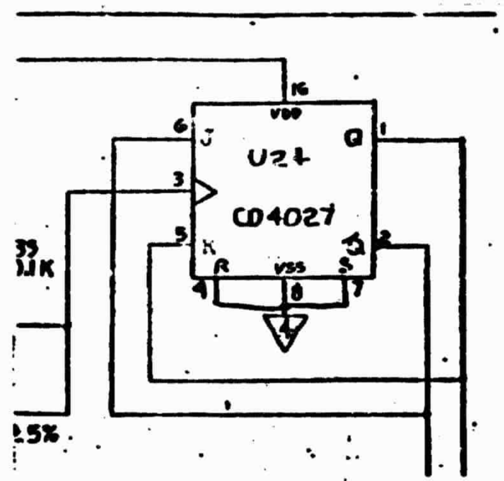
DESCRIBE CHANGE AND GIVE REASON: SET, RESET LINES TIED TO GROUND

1) ZONE 6-H

WAS



IS



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Aerospace Systems Division — Western Laboratories

W 2-4-5-A (1-78)

ENGINEERING ORDER

DIST CODE 010A — RELEASED MAR 30 '81

TITLE	JOB NO.	CODE IDENT NO.	
SCHEMATIC DIAGRAM DIGITAL TIMING CONTROL VHM	2920	13126	EO — SCH200061 NC-4

TYPE OF EO	DISPOSITION OF PARTS			
CHANGE	[X] USE	ORIG JARAMILLO DATE 3-23-81	NEXT ASSY 200061	EFFECTIVITY 1d up
VARIANCE	[ ] REWORK	CHECK	MODEL NO. 200036-01	
SUPERSEDING	[ ] SCRAP	ENGR		
NOTED	[ ] NOTED BELOW	PM 3-26-81	OTHER DWG AFFECTED 200061	ECP
		APPR		
		CUSTOMER 3-30-81		SHT 1 OF 2

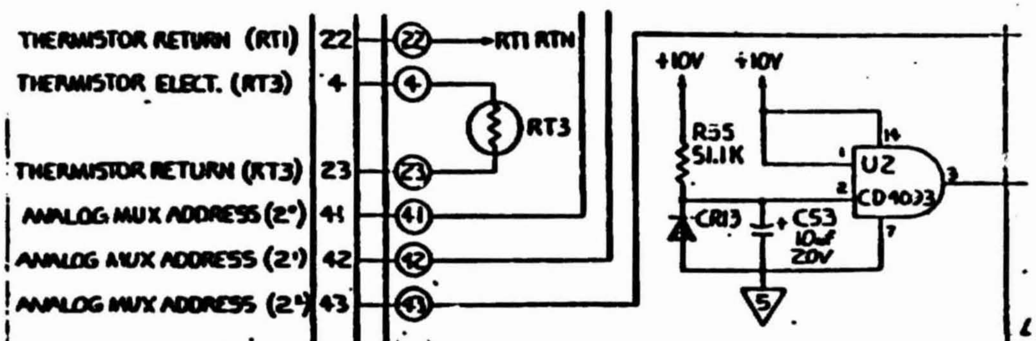
DESCRIBE CHANGE AND GIVE REASON: REDUCE OUTPUT RIPPLE

1) SHEET 3, ZONE 6-B

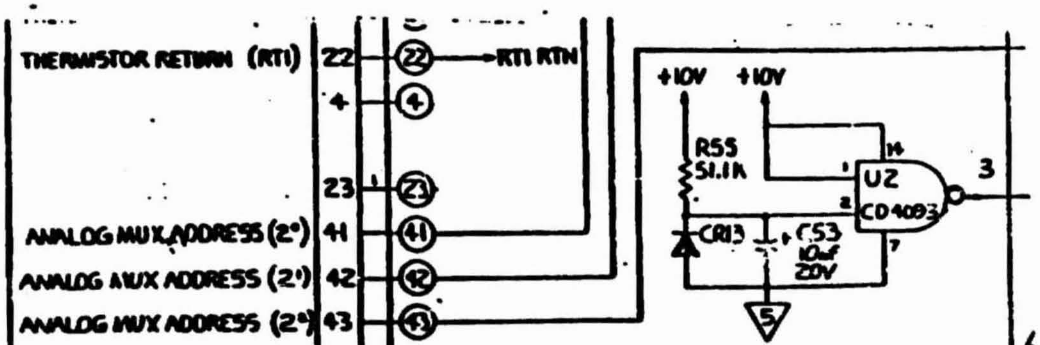
CHANGE C41 CALLOUT TO: 470 pf/200V

2) SHEET 2, ZONE 7-G CHANGE

FROM:

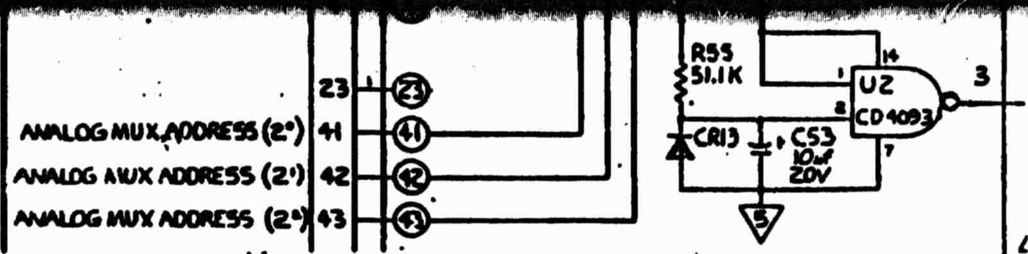


TO:



QTY REQD	NOTED ASSY	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	ZONE	ITEM NO

TO:



QTY REQD	NOTED ASSY	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	ZONE	ITEM NO

W 13-4-5-B (1-78)

Aerospace Systems Division — Western Laboratories

ENGINEERING ORDER

DIST CODE 012A RELEASED ______

DRAWING TITLE	JOB NO.	CODE IDENT NO.	
SCHEMATIC DIAGRAM DIGITAL TIMING CONTROL YHM	2920	13126	EO — SCH200061 NC-4
			SHT 2 OF 2

3. SHEET 2

ZONE 8E

CHANGE FRAME PULSE CALLOUT To $\overline{\text{FRAME PULSE}}$

ZONE 8C

CHANGE D3 WORD GATE CALLOUT To $\overline{\text{D3 WORD GATE}}$

ZONE 4E

CHANGE $\overline{\text{FORMAT}}$ CALLOUT To FORMAT

W L-4-S-A (1-78)

Aerospace Systems Division — Western Laboratories

ENGINEERING ORDER

DIST CODE 010A RELEASED JUL 20 1981

DRAWING TITLE	JOB NO.	CODE IDENT NO.	
ISPM-VHM SCHEMATIC DIAGRAM DIGITAL TIMING CONTROL AND STATUS	2920	13126	EO — SCH 200061 NC-5

TYPE OF EO	DISPOSITION OF PARTS		NEXT ASSY 200061	EFFECTIVITY
X CHANGE	☐ USE	ORIG GAUGHEN DATE 7/7/81 CHECK 7-20-81		SN 1 & UP
☐ VARIANCE	☒ REWORK	ENGR 7-16-81	MODEL NO.	
☐ SUPERSEDING	☐ SCRAP	PM 7-20-81		ECP
☐ NOTED	☐ NOTED BELOW	APPR 7/20/81 CUSTOMER 7-20-81	OTHER DWG AFFECTED 200061 PL200061	SHT 1 OF 1

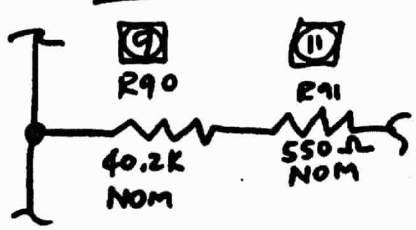
DESCRIBE CHANGE AND GIVE REASON: ENGINEERING REQUEST — ADD CAPACITOR C55 ...

SHEET 1, ZONE 2B: CHANGE LAST REFERENCE DES USED

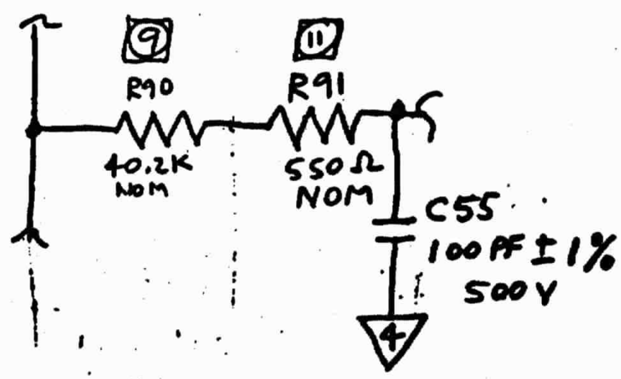
FROM	TO
C54	C55

SHEET 3, ZONE 7G ADD C55

CHANGE FROM



TO



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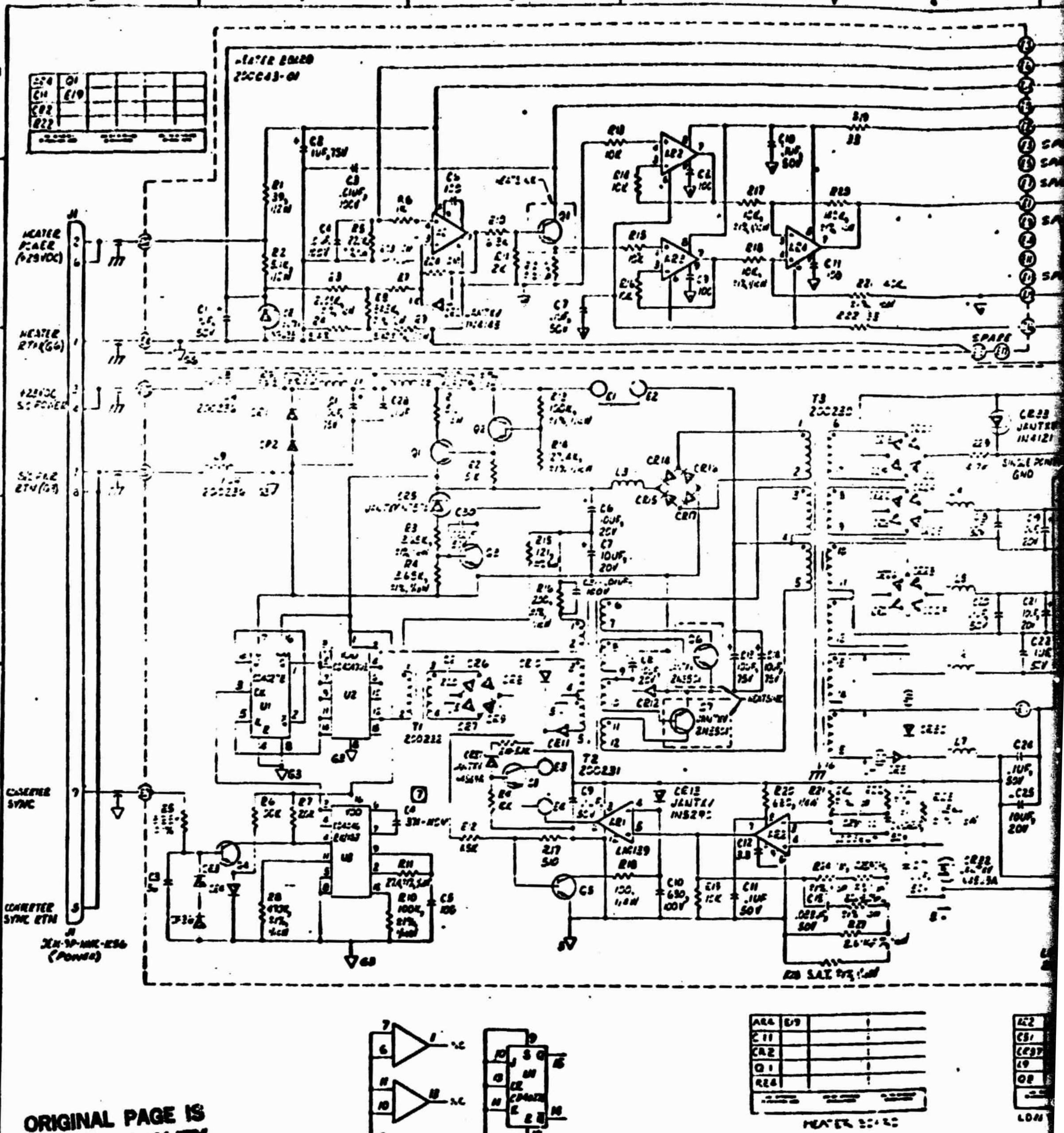
QTY REQ'D	NOTED ASSY	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	CODE ID	ZONE	ITEM NO.



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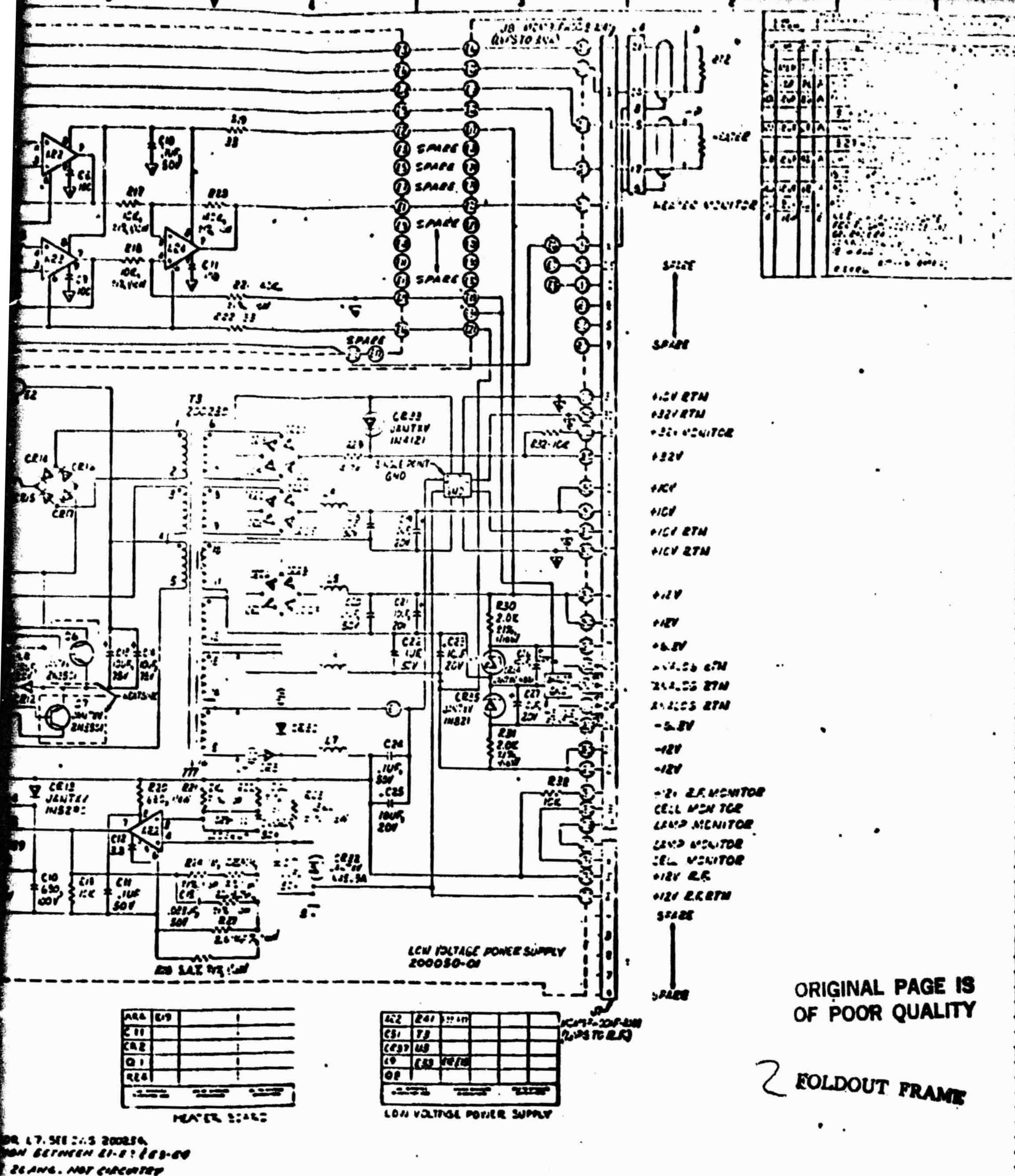
9. FOR INDUCTOR L7. SEE DWG 200259.
8. CONNECTION BETWEEN E1-E2 & E3-E4 SHALL BE 26 AWG. NOT CIRCUITRY
7. SELECT AT TEST CAPACITOR (C4) RANGE 220, 270, 330, 390, 470 ± 5%
6. FOR INDUCTORS L1-L6. SEE DWG 200225 (2.5V-)
5. ALL TRANSISTORS ARE JANTXV2N2222A
4. ALL OPAMPS ARE LM108A
3. ALL DIODES ARE FD643
2. ALL CAPACITOR VALUES ARE IN PICO FARADS, ±10%, 200V
1. ALL RESISTOR VALUES ARE IN OHMS, ±5%, 1/4W

NOTES: UNLESS OTHERWISE SPECIFIED



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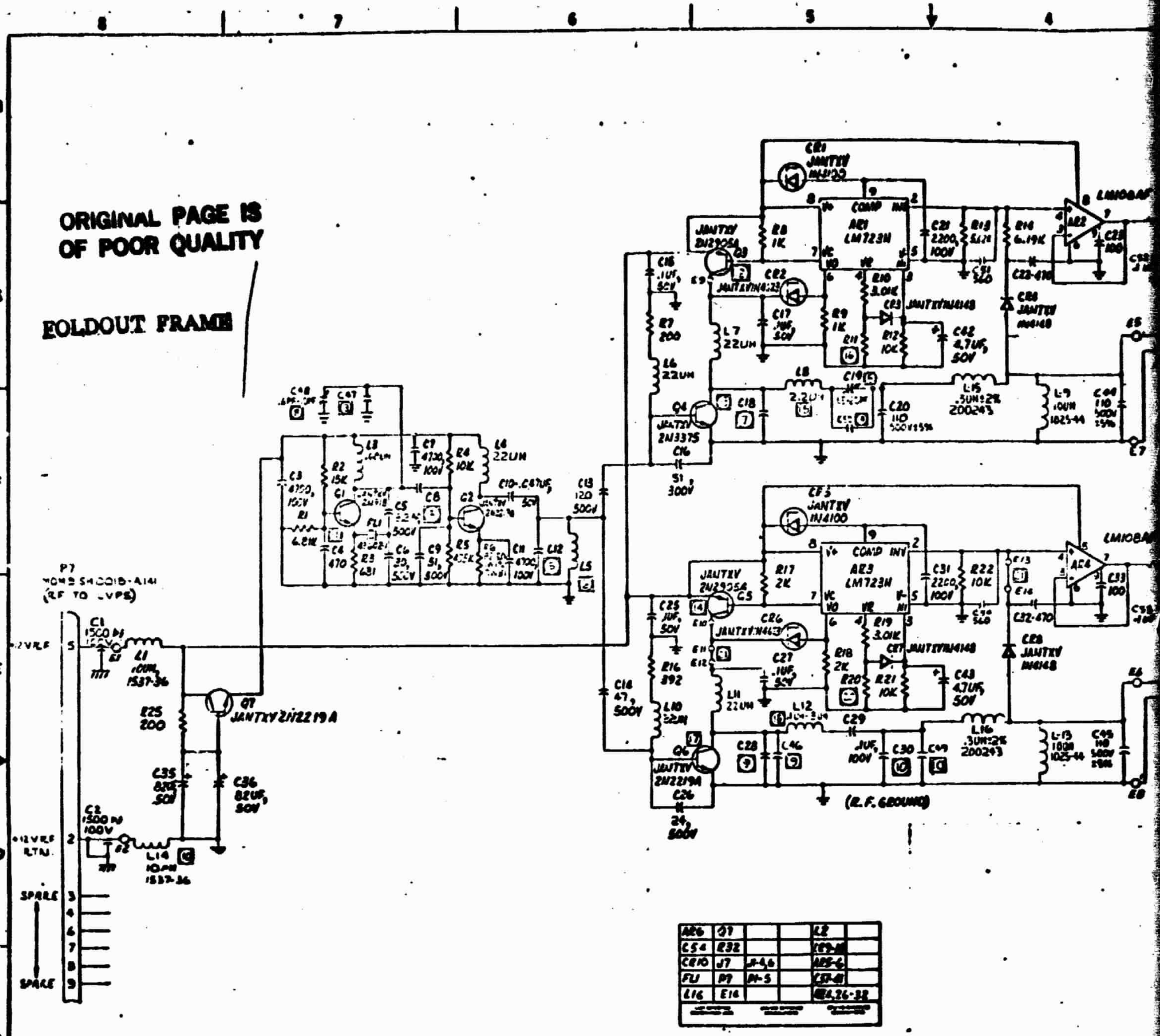


AR6	Q7			L2
C54	R32			
CR10	J7	J1-4,6		
FL1	P7	P1-5		
L16	E14			24,26-32

21 CONNECTION BETWEEN E11-E12 AND E13-E14 IS 26 AWG SHIELDED WIRE.

20 SELECT AT TEST RESISTOR R20, RANGE: 1.74K, 1.78K, 1.82K, 1.87K, 1.91K, 1.96K, 2.00K, 2.05K, 2.10K, 2.15K, 2.21K, 2.26K, 2.32K, 2.37K, 2.43K, 2.49K, 2.55K, 2.61K, 2.67K, 2.74K, 2.80K, 2.87K, 2.94K, 3.01K, 3.09K, 3.16K, 3.24K, 3.32K, 3.40K, 3.48K, 3.57K, 3.65K, 3.74K, 3.83K, 3.92K, 4.02K, 4.12K.

19 SELECT AT TEST (C50) OPF. 10 PF. 18 PF.

18 SELECT AT TEST (L12) .1UH TO 3UH.

17 PRESELECT FOR BVcbo >60V.

16 SELECT AT TEST RESISTOR R11, RANGE: 4.22K, 4.32K, 4.42K, 4.53K, 4.64K, 4.75K, 4.87K, 4.99K, 5.11K, 5.23K, 5.36K, 5.49K, 5.62K, 5.76K, 5.90K, 6.04K, 6.19K, 6.34K, 6.49K, 6.65K, 6.81K, 6.98K, 7.15K, 7.32K, 7.50K, 7.68K, 7.87K, 8.06K, 8.25K, 8.45K, 8.66K, 8.87K, 9.09K.

15 PRESELECT FOR 2.2UH TO 2.6UH.

14 PRESELECT FOR Hfe >150 AT Ic = 80ma ± 5ma.

13 PRESELECT FOR Ft >500MHZ. Hfe >18.5 AT Ic = 160ma ± 10ma; BVcbo >60V.

12 PRESELECT FOR Hfe >150 AT Ic = 160ma ± 10ma

11 PRESELECT FOR BVceo >22V.

10 SELECT AT TEST CAPACITOR (C4, C8) C4 RANGE OPF, 2 ... 15, ... 24, 27, 30, ...

NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL RESISTOR VALUES ARE IN OHMS, 1/10W ±1%
2. ALL CAPACITOR VALUES ARE IN PICO-FARADS, ±10%, 200V

3 SELECT AT TEST CAPACITOR (C47) RANGE: OPF. 10PF. 18PF. 27PF.

4 SELECT AT TEST CAPACITOR (C8) RANGE: 10PF, 12, 15PF, 500V.

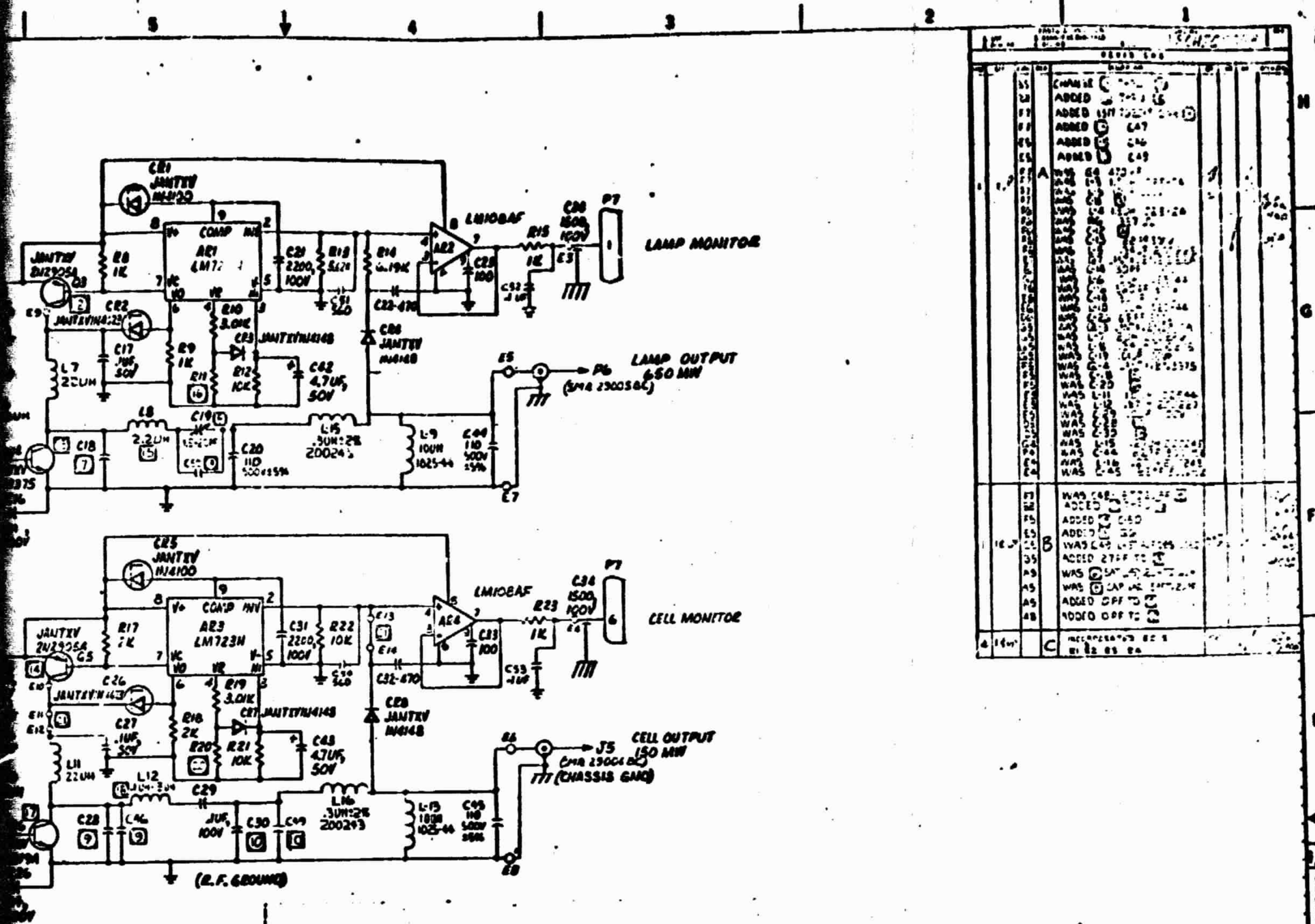
5 SELECT AT TEST CAPACITOR (C12) RANGE: 20PF, 47, OPF, 500V.

6 SELECT AT TEST CHOKE (L5) RANGE: .1 UH TO .3UH.

7 SELECT AT TEST CAPACITOR (C18) RANGE: 2.7PF, 6.8, 10, 12, 15, 16, 18, 20 & OPF, 500V

8 CAPACITOR, VARIABLE. 6PF TO 30PF. (C19), (C48)

9 SELECT AT TEST CAPACITORS (C28, C46) RANGE ...



AR6	Q7				L2	
C54	R32					
CR10	J7	J4-6				
FU	P7	P4-5				
E16	E14				R24,26-32	

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...S OTHERWISE SPECIFIED:
...ESISTOR VALUES ARE IN OHMS, 1/4W ±1%
...PACITOR VALUES ARE IN PICO-FARADS, ±10%, 200V
...T AT TEST CAPACITOR (C?) RANGE: 0 PF, 10 PF, 18 PF, 27 PF.
...T AT TEST CAPACITOR (C8) RANGE: 10 PF, 12, 15 PF, 500V.
...T AT TEST CAPACITOR (C12) RANGE: 20 PF, 47, ... PF, 500V.
...T AT TEST CHOKE (L5) RANGE: .1 UH TO .4UH.
...T AT TEST CAPACITOR (C18) RANGE: 2.7 PF, 6.8, 10, 12, 15, 16, 18, ... PF 500V
...ITOR, VARIABLE, ... PF TO ... PF. (C19), (C48)

SCHEMATIC DIAGRAM - R.F. SUPPLY,

13126 SCH200053

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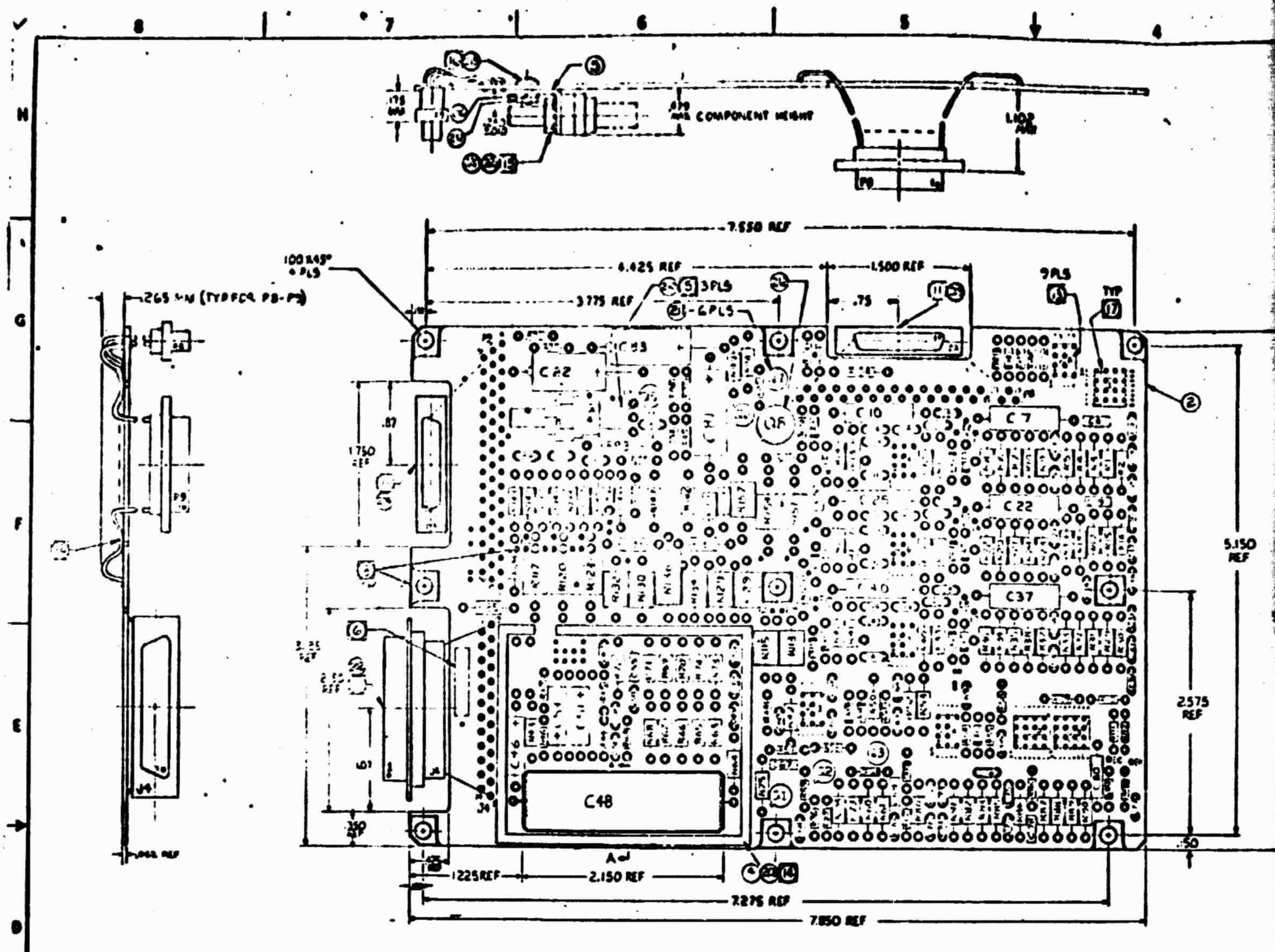
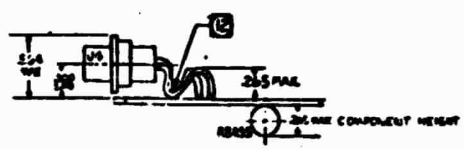
SECTION 7

PCB ASSEMBLY DRAWINGS

- ANALOG (200059)
- PRE-AMP BUFFER ASSEMBLY (200357)
- TERMINAL ASSEMBLY, TBI, ANALOG (200265)
- PRE-AMP BUFFER BOARD (200358)
- DIGITAL (200061)
- LOW VOLTAGE POWER SUPPLY (200050)
- HEATER (200043)
- RF FLIGHT CONFIGURATION (200359)
- RF, PROTO CONFIGURATION (200053)





WIRE LIST				
FROM	TO	WIRE	ITEM	LOCATION
E10	E11	26 AWG	210	FRONT
Q4-B	E22			
Q4-C	E21			
Q4-E	E23	26 AWG	210	
E26	E27	BUSS	215	
E24	E25			
E28	E29	BUSS	215	FRONT
P9-7	P8-6	[illegible]	224	REAR

17. PIN 1 IS INDICATED WITH DOT ON I.C.'S.
16. TORQUE, Q4 BRACKET TO BOARD, TO 4.3 IN.LBS, ±0.5 IN.LBS.
15. TORQUE, Q4 ASSY TO 18.6 IN.LBS ±0.5 IN.LBS.
14. SOLDER SHIELD TO BOARD, COVER TO SHIELD.
13. APPLY ABLE FILM, ITEM 209, UNDER ALL FLAT PACKS, CURE AT 150°F FOR 3HRS.
12. BOND WIRES TO BOARD PER 543024 TYPE V, USING ITEM 214.
11. LINE UP CENTER LINE OF CONNECTOR P-8, P9 & J4, TO CENTER LINE OF CUT SLOT.
10. SEE SHT 2 FOR REAR ASSY VIEW.
9. SPOT BOND PER 543024, TYPE V USING ITEM 214.
8. DO NOT CONFORMAL COAT E-PADS AND MOUNTING PADS (BOTH SIDES OF BOARD).
7. CONFORMAL COAT PER 543028 TYPE V, CLASS I, USING ITEM 192.
6. MARK SERIAL NO. AND REVISION LETTER PER 540111, CLASS I, TYPE III, USING ITEMS 190 & 191.
5. SOLDER PER NHB 5300.4.3A-1 USING ITEM NO. 213.
4. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATION PREFIX WITH UNIT ASSEMBLY DESIGNATION.
3. CORRELATE REFERENCE DESIGNATIONS TO COMPONENTS BY SEPARATE PARTS LIST, [illegible]00059.
2. FOR TEST SPEC, SEE 5200059.
1. [illegible]

NOTES: [illegible] OTHERWISE SPECIFIED

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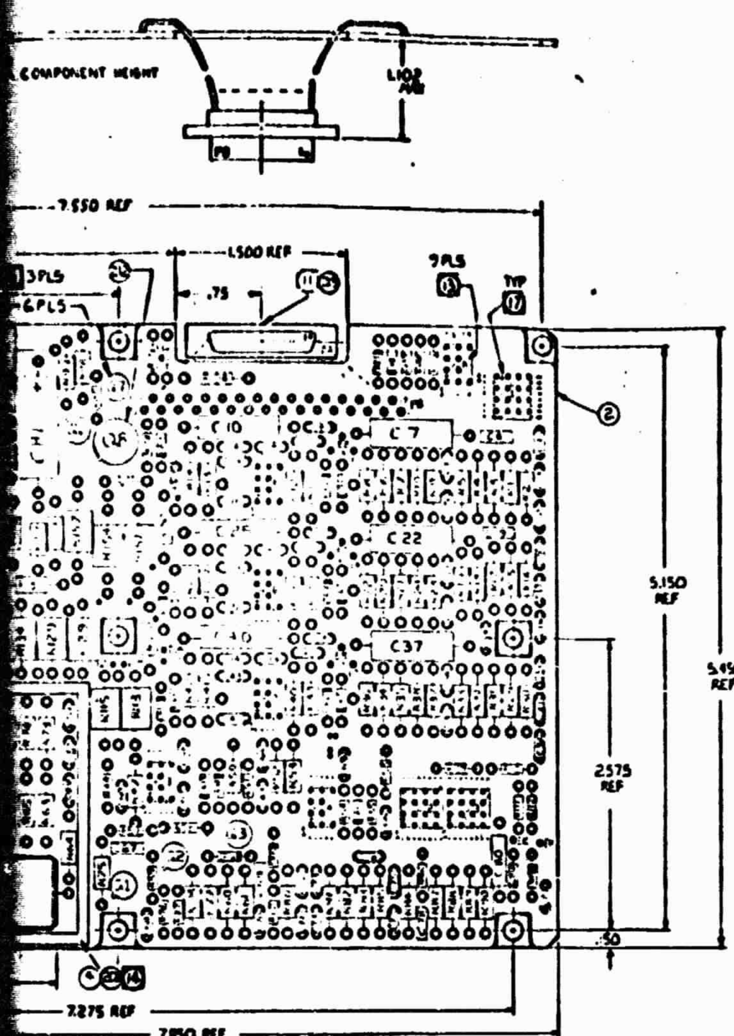

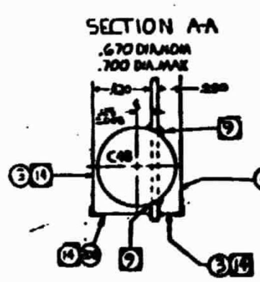

WIRE LIST				
FROM	TO	WIRE	ITEM	LOCATION
E10	E11	26 AWG	210	FRONT
Q4-B	E22			
Q4-C	E21			
Q4-E	E23	26 AWG	210	
E26	E27	BUSS	215	
E24	E25			
E28	E29	BUSS	215	FRONT
P9-7	P8-6	[illegible]	224	REAR

17. PIN 1 IS INDICATED WITH DOT ON I.C.'S.
16. TORQUE, Q4 BRACKET TO BOARD, TO 4.3 IN.LBS ± 0.5 IN.LBS.
15. TORQUE, Q4 ASSY TO 18.6 IN.LBS ± 0.5 IN.LBS.
14. SOLDER SHIELD TO BOARD, COVER TO SHIELD.
13. APPLY ABLE FILM, ITEM 209, UNDER ALL FLAT PACKS, CURE AT 150 °F FOR 3 HRS.
12. BOND WIRES TO BOARD PER 543024 TYPE II, USING ITEM 214.
11. LINE UP CENTER LINE OF CONNECTOR P8, P9 & J4, TO CENTER LINE OF CUT SLOT.
10. SEE SHT 2 FOR REAR ASSY VIEW.
9. SPOT BOND PER 543024, TYPE II USING ITEM 214.
8. DO NOT CONFORMAL COAT E-PADS AND MOUNTING PADS (BOTH SIDES OF BOARD).
7. CONFORMAL COAT PER 543028 TYPE II, CLASS I, USING ITEM 192.
6. MARK SERIAL NO. AND REVISION LETTER PER 540111, CLASS I, TYPE III, USING ITEMS 190 & 191.
5. SOLDER PER NHB 5300.4.3A USING ITEM NO. 213.
4. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATION PREFIX WITH UNIT ASSEMBLY DESIGNATION.
3. CORRELATE REFERENCE DESIGNATIONS TO COMPONENTS BY SEPARATE PARTS LIST, PL200059.
2. FOR TEST SPEC, SEE S200059.
1. FOR SCHEMATIC SEE, [illegible]
NOTES: UNLESS OTHERWISE SPECIFIED

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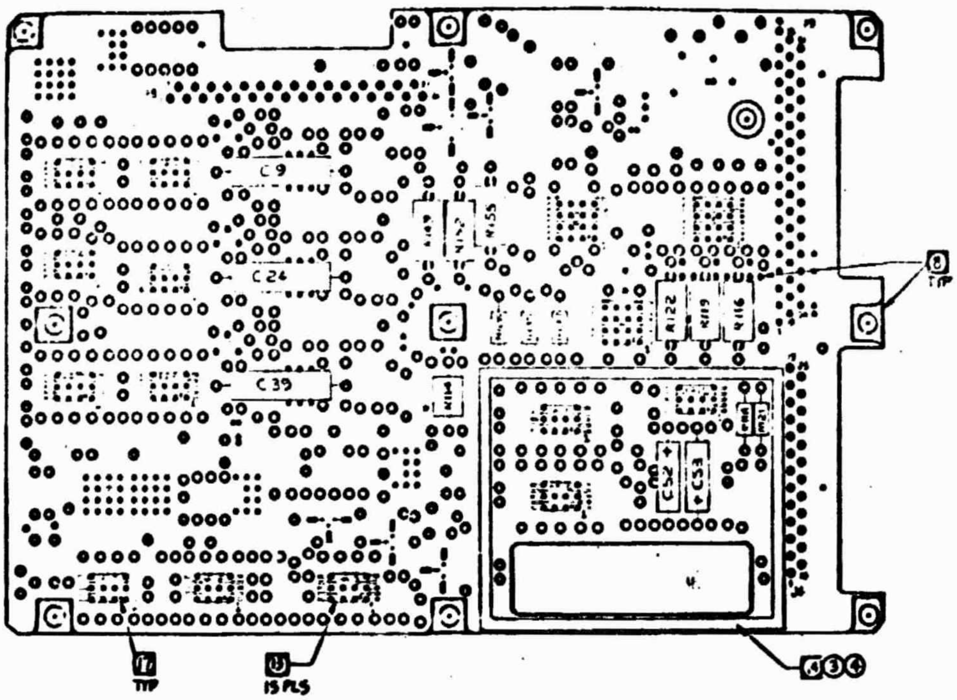
FOLDOUT FRAME

FOR PARTS LIST SEE PL-200059



REAR ASSY VIEW

Aerospace Systems Division — Western Laboratories

ENGINEERING ORDER

UNIT CODE 010-A RELEASED

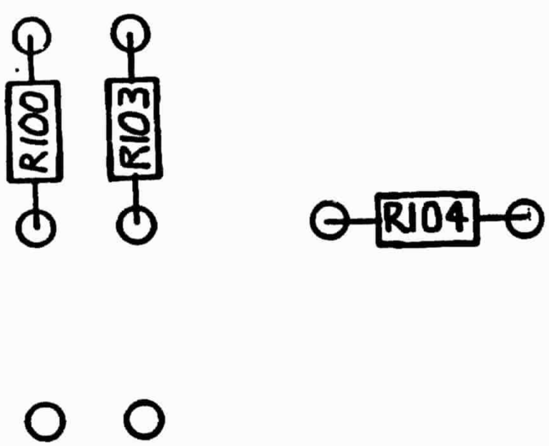
DRAWING TITLE	JOB NO	CODE IDENT NO	
PRINTED WIRING BOARD ASSEMBLY ANALOG. VHM	2920	13126	EO — 200059 NC-1

TYPE OF EO	DISPOSITION OF PARTS				
☐ CHANGE	☐ USE	ORIG [illegible] DATE 12-18-80	NEXT ASSY	200059	EFFECTIVITY SN1 (PROTO ONLY)
☒ VARIANCE	☒ REWORK	CHECK [illegible]	MODEL NO.	200036-01	
☐ SUPERSEDING	☐ SCRAP	ENGR [illegible] 12/18/80	OTHER DWG AFFECTED	PL 200059	ECP
☐ NOTED	☒ NOTED BELOW	PM [illegible] 12/19/80			SHT 1 OF 4
		APPR [illegible] 12/19/80			
		CUSTOMER			

DESCRIBE CHANGE AND GIVE REASON:

1. ZONE 5G-6G, SHEET 1

WAS



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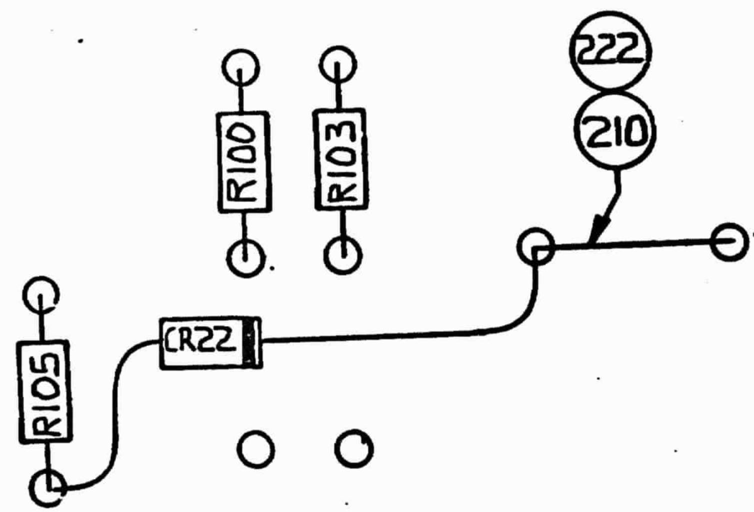
IS



VARIANCE EO

TO BE INCORPORATED ONLY WHEN SPECIFIED BY PURCHASE ORDER

REASON FOR ABOVE: REQUIRED DESIGN ENGINEERING CHANGES.

QTY REQD PER NOTED ASSY	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES		ITEM NO

FOLDOUT FRAME

TO BE INCORPORATED ONLY
WHEN SPECIFIED BY PURCHASE ORDER

REASON FOR ABOVE: REQUIRED DESIGN ENGINEERING CHANGES.

QTY REQD PER NOTED ASSY	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES		ITEM NO

ENGINEERING ORDER

Research Corporation

DRAWING TITLE	JOB NO.	CODE IDENT NO.	
PRINTED WIRING BOARD ASSEMBLY ANALOG-VHM	2920	13126	EO — 200059 NC-1

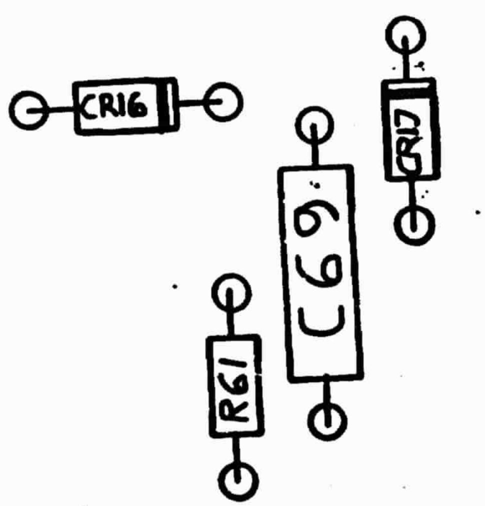
DIST CODE ____ RELEASED ____

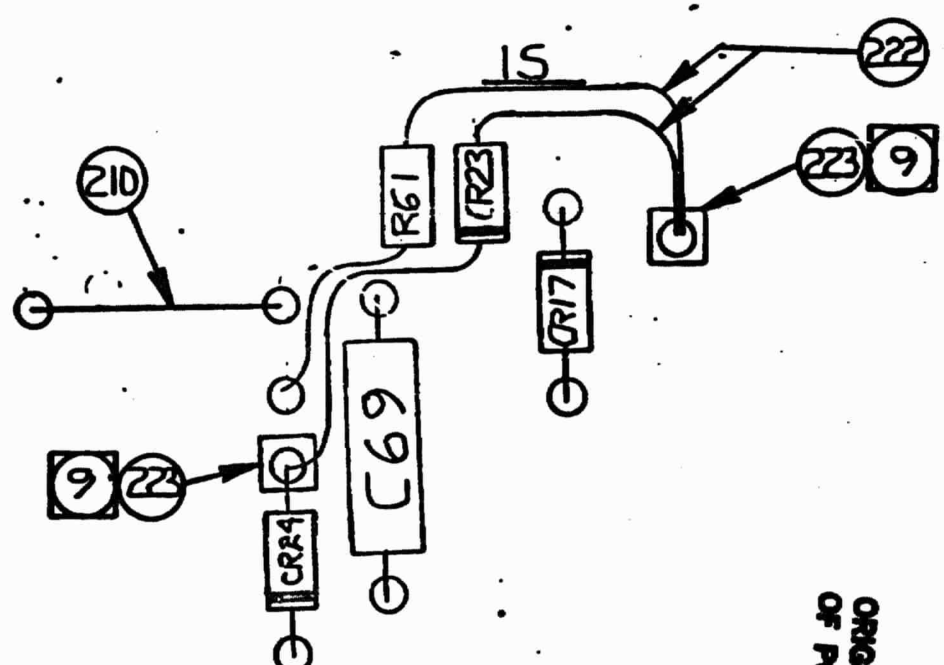
SHT 2 OF 4

2. DELETED

3. ZONE 5-G.

WAS





2 FOLDOUT FRAME

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Ball Brothers Research Corporation

ENGINEERING ORDER

DRAWING TITLE	JOB NO.	CODE IDENT NO.	
PRINTED WIRING BOARD ASSEMBLY ANALOG-VHM	2920	13126	EO – 200059 NC-1

CUST CODE ___ RELEASED ___

SHT 3 OF 4

4. ZONE 5 E, SHEET 1.

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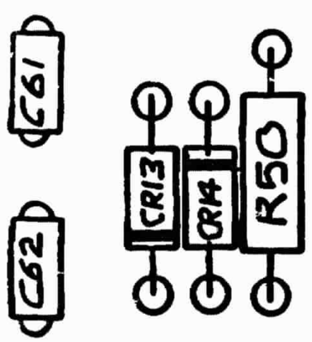
WAS



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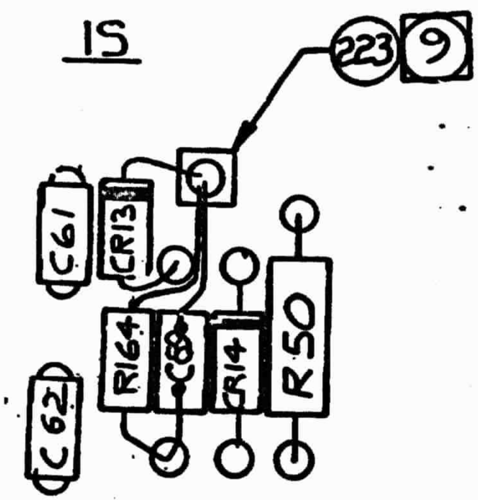


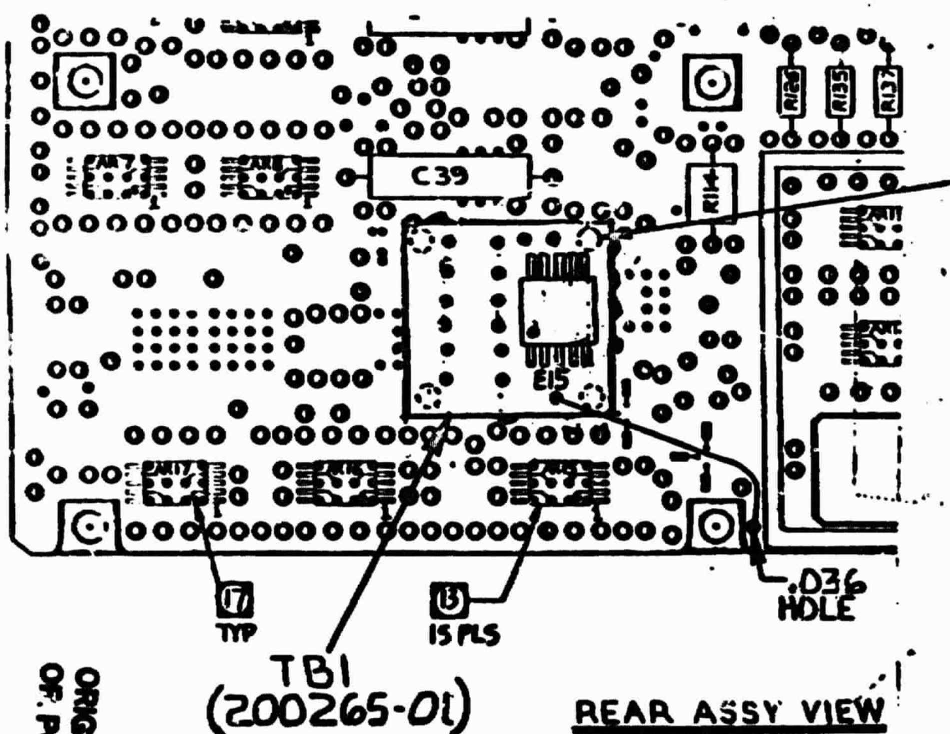
SLEEVE AS REQUIRED USING ITEM 222.

Ball Brothers Research Corporation

ENGINEERING ORDER

DRAWING TITLE	JOB NO.	CODE IDENT NO.	DIST CODE / RELEASED
PRINTED WIRING BOARD ASSEMBLY ANALOG VHM	2920	13126	EO — 200059 NC-1
			SHT 4 OF 4

5. ZONE G-E SHEET 2.



BOND SPACERS TO PWB USING ITEM 214 (4 PLS)

INTERCONNECT TB1 TO PWB AS FOLLOWS (USE 32AWG HAYWIRE) (ITEM 224)

TB1-E1	TO	U3-7
TB1-E2	TO	U3-16
TB1-E5	TO	AR13-4
TB1-E 12	TO	P9-44
TB1-E 13	TO	U14-8
TB1-E 14	TO	U14-6
TB1-E 15	TO	CR13-C (VIA .036 HOLE)

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W L-4-5-A (1-78)

Aerospace Systems Division — Western Laboratories

ENGINEERING ORDER

DIST CODE 010A — RELEASED JAN 26 '81

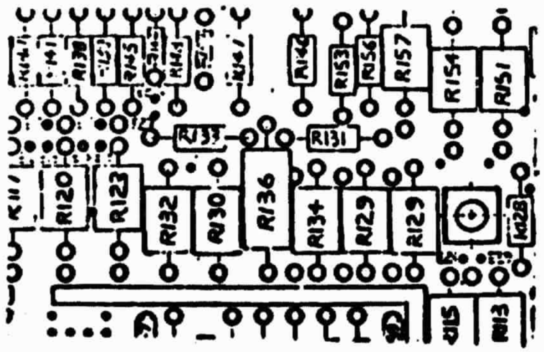
DRAWING TITLE	JOB NO.	CODE IDENT NO.	
PRINTED WIRING BD, ASSY ANALOG - VHM	2920	13126	EO — 200059 NC-2

TYPE OF EO	DISPOSITION OF PARTS			
CHANGE	[X] USE	ORIG Jaramillo DATE 1/15/81	NEXT ASSY 200059	EFFECTIVITY
VARIANCE	[ ] REWORK	CHECK [signature] 1/16/81	MODEL NO. 200036-01	SN 1 ONLY
SUPERSEDING	[ ] SCRAP	ENGR [signature] 1/16/81		ECP
NOTED	[X] NOTED BELOW	PM D Snyder 1/16/81	OTHER DWG AFFECTED PL200059	SHT 1 OF 4
		APPR [signature] 1/16/81		
		CUSTOMER		

DESCRIBE CHANGE AND GIVE REASON:
ACCOMMODATE COMPONENT SIZE CHANGES, RESULTING FROM COMPONENT AVAILABILITY.

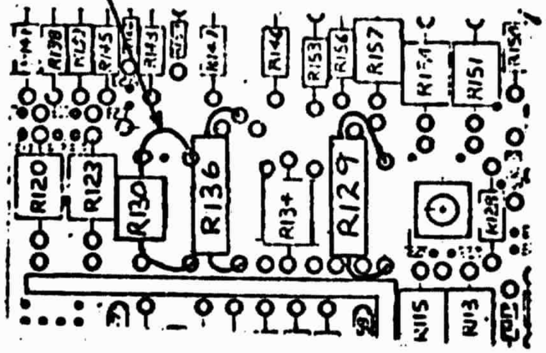
SHEET 1, ZONE F6

WAS



IS

222 AS REQ'D (6 PLCS)



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VARIANCE EO

TO BE INCORPORATED ONLY WHEN SPECIFIED BY PURCHASE ORDER

QTY REQD	NOTED ASSY	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	ZONE	ITEM NO

WHEN SPECIFIED BY PURCHASE ORDER

QTY REQ'D	NEXT ASSY	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	ZONE	ITEM NO

Ball Brothers Research Corporation

ENGINEERING ORDER

WAS-4-J-B (1-70)

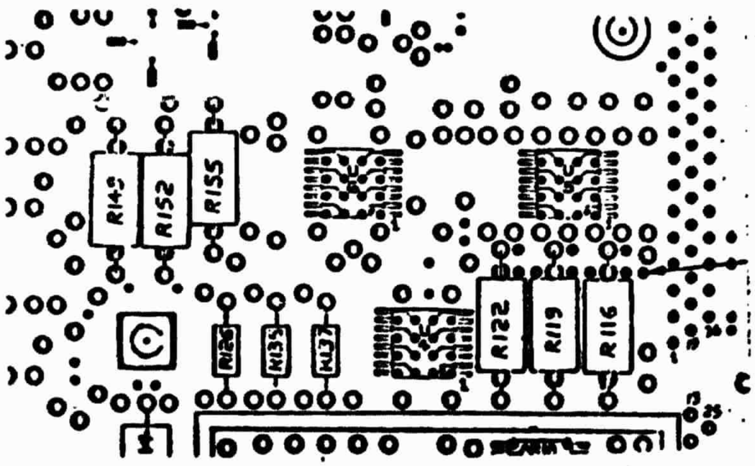
DIST CODE ____ RELEASED ____

DRAWING TITLE	JOB NO.	CODE IDENT NO.	
PRINTED WIRING BD. ASSY ANALOG - VHM	2920	13126	EO — 200059 NC-2

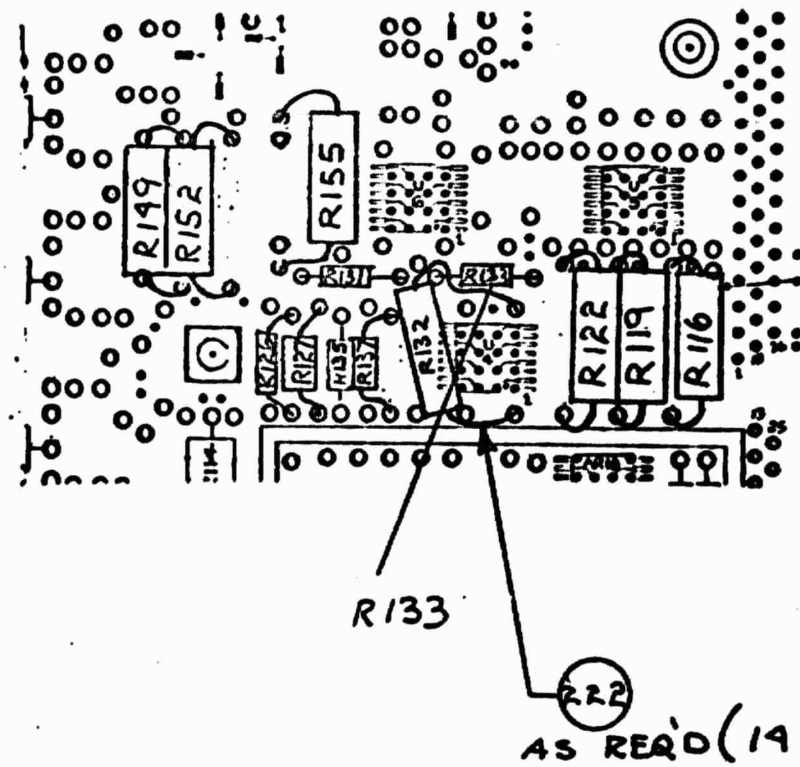
SHT 2 OF

2) SHEET 2, ZONE 5-F

WAS



IS



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Ball Brothers Research Corporation

ENGINEERING ORDER

WAB-4-3-B (1-78)

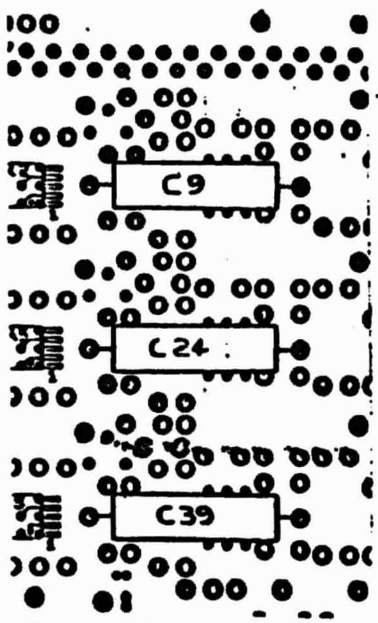
DIST CODE ____ RELEASED ____

DRAWING TITLE	JOB NO.	CODE IDENT NO.	
PRINTED WIRING BD. ASSY ANALOG - VHM	2920	13126	EO — 200059 NC-2

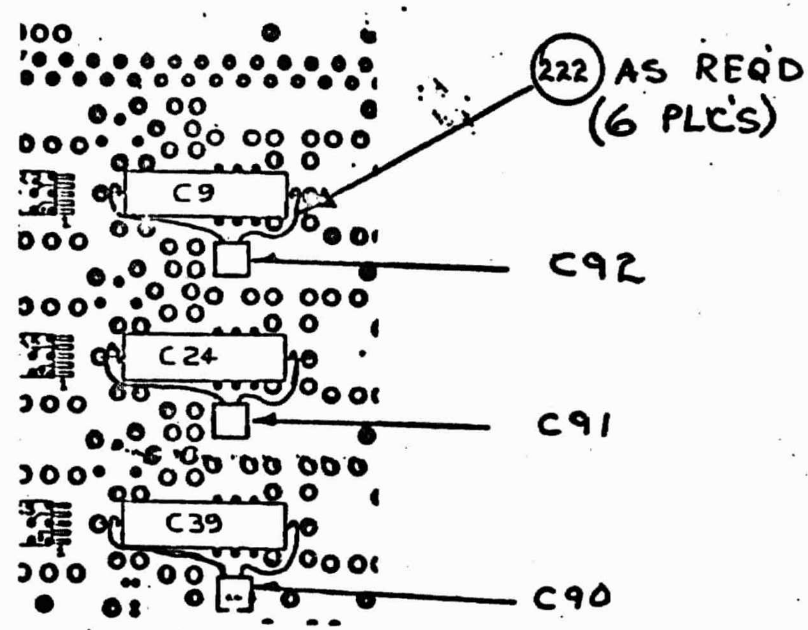
SHT 3 OF

3.) ADD C90, C91, C92 AS NOTED
SHEET 2, ZONE 6-F

WAS



IS



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OF POOR QUALITY

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Ball Brothers Research Corporation

ENGINEERING ORDER

WAB-4-3-B (1-70)

DIST CODE ____ RELEASED ____

DRAWING TITLE	JOB NO.	CODE IDENT NO.	
PRINTED WIRING BD. ASSY ANALOG-VHM	2920	13126	EO—200059 NC-2

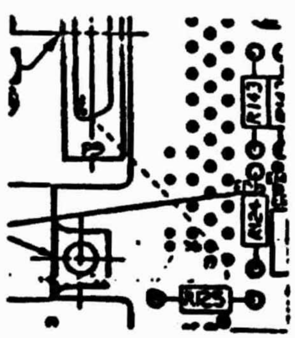
SHT 4 OF 4

4.) SHEET 1, ZONE 4-G

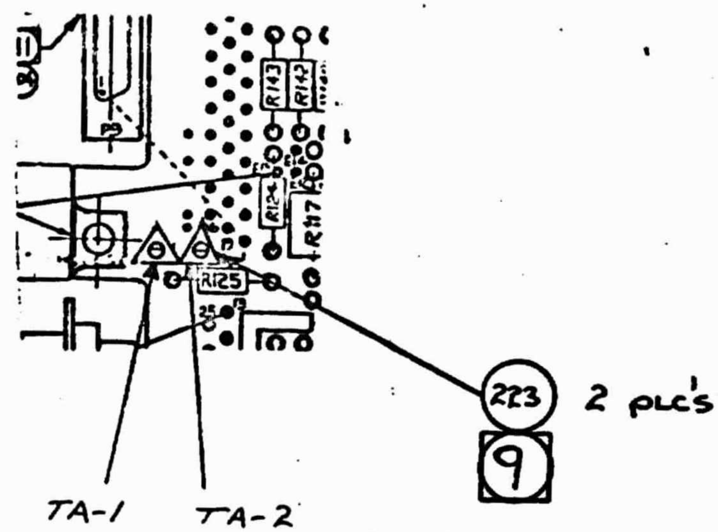
WAS	IS
AR8	AR18

5.) INSTALL TERMINAL ASSY'S, AND REWIRE P9, AND J4 AS NOTED. (ISOLATION OF SHIELDS)

WAS



IS



WIRE LIST		
FROM	TO	ITEM
TA-1	TA-2	210
J4-5	TA-1	—
J4-8	TA-1	-
J4-19	TA-2	—
P9-7	TA-2	-

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FOLDOUT FRAME 2

Aerospace Systems Division   Western Laboratories

W L-4-5-A (1-78)

ENGINEERING ORDER

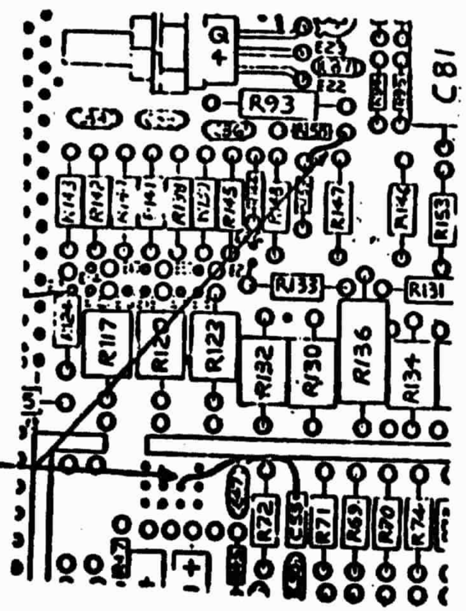
DIST CODE Q12A   RELEASED MAR 30 '81

DRAWING	JOB NO.	CODE IDENT NO.	
PRINTED WIRING BOARD ASSEMBLY Analog VHM	2920	13126	EO — 200059 NC-4

TYPE OF EO	DISPOSITION OF PARTS			
[X] CHANGE	[X] USE	ORIG JARAMILLO DATE 3-26-81	NEXT ASSY 200059	EFFECTIVITY
[ ] VARIANCE	[ ] REWORK	CHECK RJ	MODEL NO. 200036-01	SN 1 (PROTO) ONLY
[ ] SUPERSEDING	[ ] SCRAP	ENGR		
[ ] NOTED	[ ] NOTED BELOW	PM D. Aoki 3-27-81	OTHER DWG AFFECTED —	ECP
		APPR 3/30/81		
		CUSTOMER W(BD) 3-30-81		SHT 1 OF 2

DESCRIBE CHANGE AND GIVE REASON: ARTWORK ERRORS

1.) SHEET 1
ZONE 6 F/E



INSTALL AND SOLDER a HAYWIRE (ITEM 224)

R158 To R159
AR10-7 To C55

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VARIANCE EO

TO BE INCORPORATED ONLY WHEN SPECIFIED BY PURCHASE ORDER

QTY REQ	NOTED ASSY	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	ZONE	ITEM NO

W L-4-5-B (1-78)

QTY REQ	NOTED ASSY	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	ZONE	ITEM NO

W L-4-5-B (1-78)

Ball Aerospace Systems Division Western Laboratories

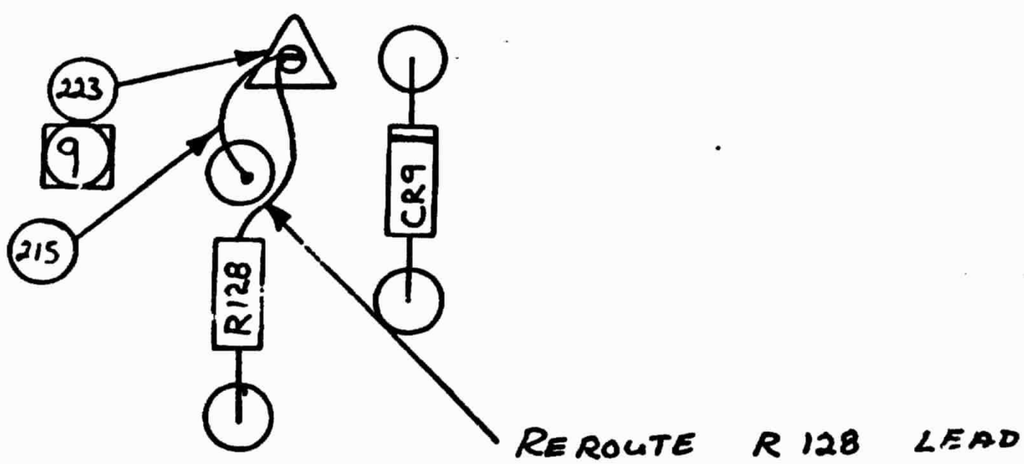
ENGINEERING ORDER

DIST CODE 010A RELEASED

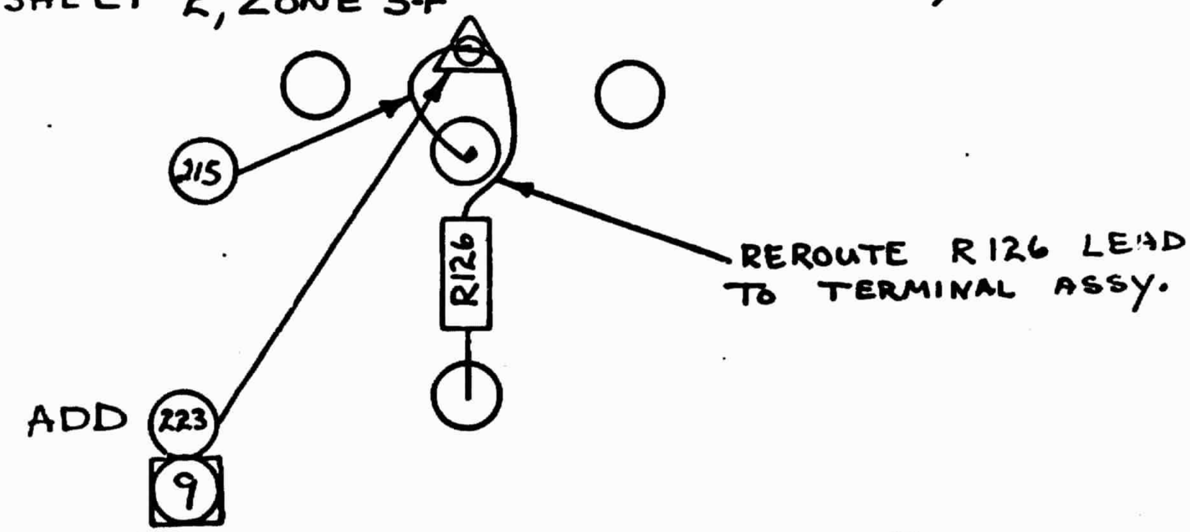
DRAWING TITLE	JOB NO.	CODE IDENT NO.	
PRINTED WIRING BOARD ASSEMBLY ANALOG VHM	2920	13126	EO — 200059 NC-4

SHT 2 OF 2

2.) SHEET 1, ZONE 5-F
ADD TERMINAL ASSY AS NOTED



3.) SHEET 2, ZONE 5-F



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FOLDOUT FRAME 2

Aerospace Systems Division — Western Laboratories

W L-4-5-A (1-78)

ENGINEERING ORDER

DIST CODE 010A RELEASED MY 12 '81

DRAWING TITLE: PRINTED WIRING BOARD ASSY ANALOG

JOB NO.	CODE IDENT NO.	
2920	13126	EO — 200059 A-1

TYPE OF EO	DISPOSITION OF PARTS		DATE
☒ CHANGE	☒ USE	ORIG WPBJ	
☐ VARIANCE	☐ REWORK	CHECK CN	5-4-81
☐ SUPERSEDING	☐ SCRAP	ENGR	
☐ NOTED	☐ NOTED BELOW	PM D. D. A.	5-4-81
		APPR TDK (QA)	5-4-81
		CUSTOMER WPBJ	5-4-81

NEXT ASSY 200059

MODEL NO.

OTHER DWG AFFECTED —

EFFECTIVITY: SN 1 & UP

ECP

SHT 1 OF 1

DESCRIBE CHANGE AND GIVE REASON: DRAFTING ERROR

1. CHANGE EFFECTIVITY ON EO'S; NC-1 & NC-2.
   FROM: SN 1 (PROTO) ONLY
   TO: SN 1 & UP

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2. ON EO NC-1 SHEET 4 CHANGE CALLOUT:

FROM:
TBi
(200265-01)

TO:
TB1
(200265-01) SN 1
(200357-01) SN 2 & UP

QTY RE	R NOTED ASSY	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	CODE	ZONE	ITEM NO.

QTY RE	N NOTED ASSY	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	CODE	ZONE	ITEM NO.

W L-4-5-A (1-78)

Ball Aerospace Systems Division — Western Laboratories

ENGINEERING ORDER

DIST CODE 010A · RELEASED JUL 20 1981

DRAWING TITLE	JOB NO.	CODE IDENT NO.	
PRINTED WIRING BOARD ASSY ANALOG VHM	2920	13126	EO — 200059 A-2

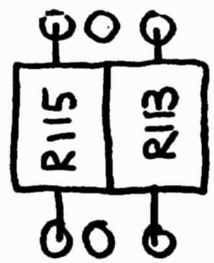
TYPE OF EO	DISPOSITION OF PARTS				
☒ CHANGE	☐ USE	ORIG GAUGHEN DATE 7/16/81	NEXT ASSY 200056	EFFECTIVITY SH 1 & UP
☐ VARIANCE	☒ REWORK	CHECK WPBS 7-20-81	MODEL NO.	
☐ SUPERSEDING	☐ SCRAP	ENGR [signature] 7-16-81		
☐ NOTED	☐ NOTED BELOW	PM [signature] 7-20-81	OTHER DWG AFFECTED SCH 200059 PL 200059	ECP
		APPR [signature]		
		CUSTOMER WPBS 7-20-81		SHT 1 OF 1

DESCRIBE CHANGE AND GIVE REASON: ENGINEERING REQUEST — PARTS AVAILABILITY:

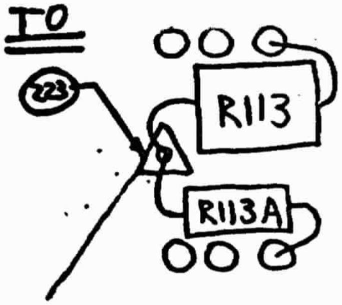
ADD R113A IN SERIES WITH R113; ADD R114A IN SERIES WITH R114
MOVE R115 TO OPPOSITE SIDE OF BOARD, ADD TERMINALS, ITEM 223

SHEET 1, ZONE 5G/6E CHANGE:

FROM

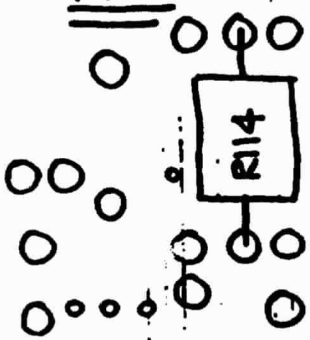


TO



SHEET 2, ZONE 6E CHANGE:

FROM



TO

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2 FOLDOUT FRAME

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Aerospace Systems Division — Western Laboratories

W L-4-5-A (1-78)

ENGINEERING ORDER

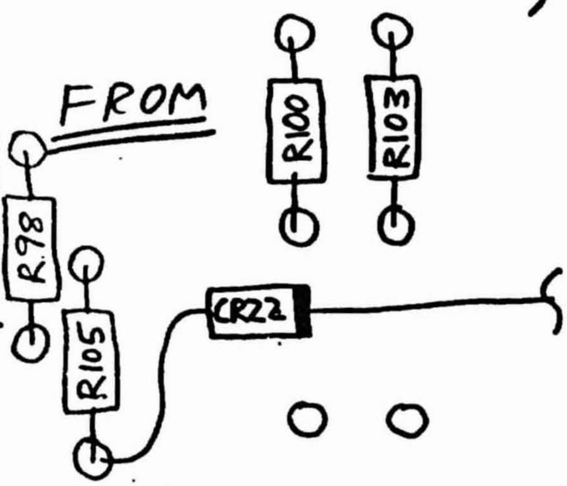
DIST CODE 010A — RELEASED OCT 0 N 1981

TITLE	JOB NO.	CODE IDENT NO.	EO NO.
PRINTED WIRING BOARD ASSY ANALOG VHM	2920	13126	EO — 200059 A-3

TYPE OF EO	DISPOSITION OF PARTS		DATE		
CHANGE	☐ USE	ORIG GAUGHEN	5 OCT 81	NEXT ASSY 200056	EFFECTIVITY SN-1 & UP
VARIANCE	☒ REWORK	CHECK WPBJ	10-5-81	MODEL NO.	
SUPERSEDING	☐ SCRAP	ENGR RZ	10-5-81		
NOTED	☐ NOTED BELOW	PM D.A.O.	10-6-81	OTHER DWG AFFECTED NONE	ECP
		APPR [illegible]	10/5/81		
		CUSTOMER WPBS	10-8-81		SHT 1 OF 1

DESCRIBE CHANGE AND GIVE REASON: DRAFTING ERROR — EO 200059 NC-1 (SHEETS: 1 & 4) IS PARTIALLY INCORRECT.

ZONE 5G/6G
CHANGE ANODE OF CR22 HOOKUP; ADD SLEEVING ITEM 222 (SHEET 1)



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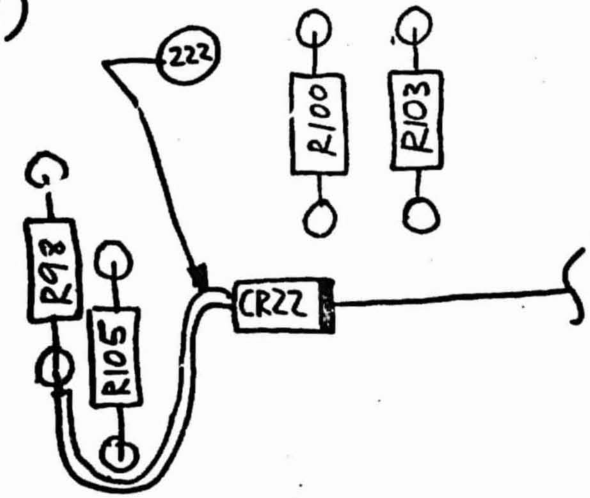


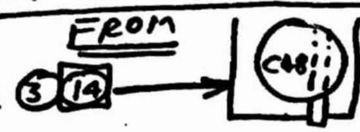
(SHEET 4)

IN WIRE TABLE.
CHANGE WIRING

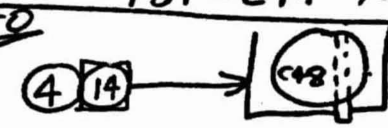
FROM TB1-E13 TO U14-8
TB1-E14 TO U14-6

TO TB1-E13 TO AR14-8
TB1-E14 TO AR14-6

ZONE 3E · CHANGE CALLOUT FROM



TO



QTY REQD	NOTED ASSY	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	CODE IDENT	ZONE	ITEM NO.

QTY REQD	NOTED ASSY	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	CODE IDENT	ITEM NO.

W L-4-5-A (1-78)

Aerospace Systems Division — Western Laboratories

ENGINEERING ORDER

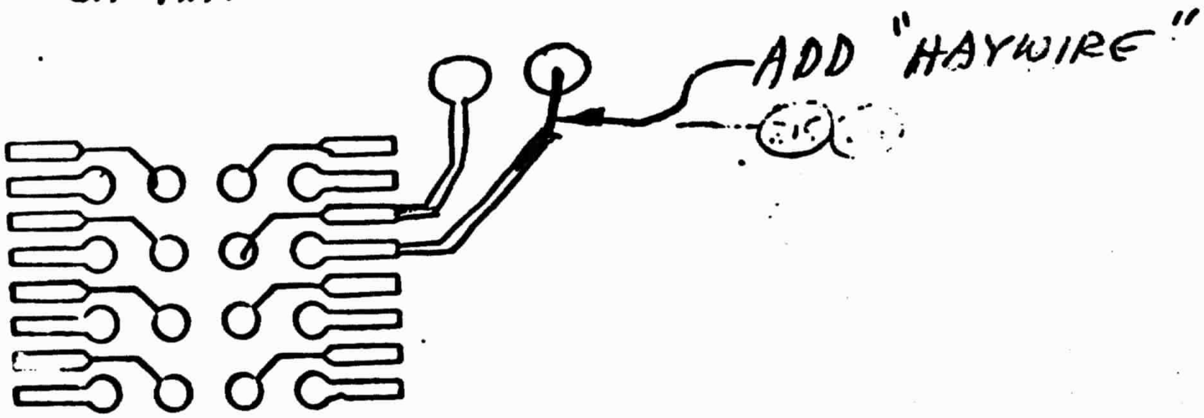
DIST CODE 010A RELEASED OCT 08 1981

DRAWING TITLE	JOB NO.	CODE IDENT NO.	
PRINTED WIRING BOARD ASSY ANALOG, VHM	2920	13126	EO — 200059 A-4

TYPE OF EO	DISPOSITION OF PARTS				
☒ CHANGE	☐ USE	ORIG GAUGHEN DATE 10/5/81	NEXT ASSY 200056	EFFECTIVITY
☐ VARIANCE	☒ REWORK	CHECK W(PD) 10-9-81	MODEL NO.	SN 2 ONLY
☐ SUPERSEDING	☐ SCRAP	ENGR [illegible]		
☐ NOTED	☐ NOTED BELOW	PM [illegible] 10-6-81	OTHER DWG AFFECTED PC200060	ECP
		APPR [illegible]		
		CUSTOMER WPGS 10-8-81		SHT 1 OF 1

DESCRIBE CHANGE AND GIVE REASON: CIRCUIT TAPE ON ORIGINAL ARTWORK WAS REMOVED BY ERROR OR ACCIDENT

ADD 32 GA "HAYWIRE" AS SHOWN



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Aerospace Systems Division — Western Laboratories

W L-4-5-A (1-78)

ENGINEERING ORDER

DIST CODE 010A   RELEASED OCT 29 1981

DRAWING TITLE	JOB NO.	CODE IDENT NO.	
PW BOARD ASSY, ANALOG VHM	2920	13126	EO — 200059 A-5

TYPE OF EO	DISPOSITION OF PARTS		NEXT ASSY 200056	EFFECTIVITY SN 1 & UP
☒ CHANGE	☐ USE	ORIG WPB DATE 10-26-81	MODEL NO.	
☐ VARIANCE	☒ REWORK	CHECK		
☐ SUPERSEDING	☐ SCRAP	ENGR 10/27/81	OTHER DWG AFFECTED	ECP
☐ NOTED	☐ NOTED BELOW	APPR		SHT 1 OF 1
		CUSTOMER		

DESCRIBE CHANGE AND GIVE REASON:

TO ISOLATE RTI SHIELD

1. CHANGE WIRE LIST,

   FROM: P9-7 P8-6

   TO: TA-2 P8-6 PAD

2. ON EO NC 2 SHEET 4

   DELETE P9-7 TO TA-2 FROM WIRE LIST

ORIGINAL PAGE IS OF POOR QUALITY

FOLDOUT FRAME

NO.	NOTED ASSY	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	CODE IDENT	ZONE	ITEM NO.

QTY REQ			NOTED ASSY	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	CODE IDENT	ZONE	ITEM NO.

Aerospace Systems Division — Western Laboratories

ENGINEERING ORDER

W 2-4-5-A (1-78)

DIST CODE 010A RELEASED NOV 24 1981

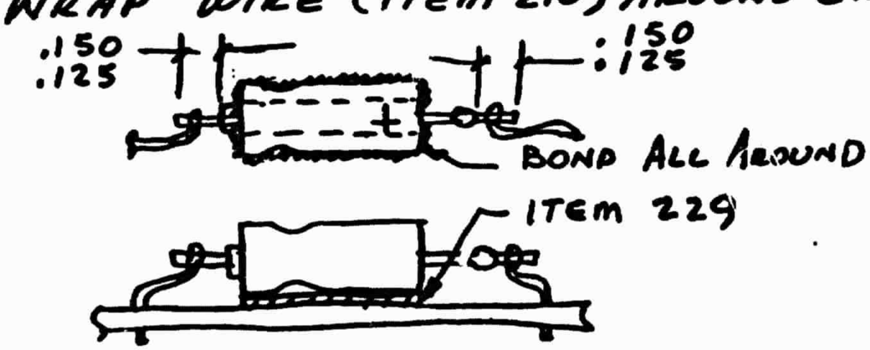
DRAWING TITLE	JOB NO.	CODE IDENT NO.	
PW BOARD ASSY ANALOG VHM	2920	13126	EO — 200059A-6

TYPE OF EO	DISPOSITION OF PARTS		DATE		
☒ CHANGE	☐ USE	ORIG WPB3	11-23-81	NEXT ASSY 200056	EFFECTIVITY *
☐ VARIANCE	☒ REWORK	CHECK WPB3	11-23-81	MODEL NO.	
☐ SUPERSEDING	☐ SCRAP	ENGR [illegible]	11-23-81		
☐ NOTED	☐ NOTED BELOW	PM [illegible]	11-23-81	OTHER DWG AFFECTED PL200059	ECP
		APPR [illegible]	11-23-81		
		CUSTOMER WPB3	11-23-81		SHT 1 OF 1

DESCRIBE CHANGE AND GIVE REASON:

*SN 1 & UP

1. ON CAPACITORS C82 & C83,
   - A. REMOVE SLEEVING FROM CAP. BODY
   - B. SAVE YELLOW DOT & SERIAL NO. & BOND TO CAP. BODY
   - C. TRIM LEADS AS SHOWN BELOW (.125 TO .150)
   - D. BOND INSULATOR (ITEM 229) & CAPS TO BOARD PER NOTE 9 (ALL AROUND)
   - E. WRAP WIRE (ITEM 210) AROUND CAP LEADS 270° TO 360°



*SN 2 ONLY

2. ADD C84A TO FAR SIDE OF BOARD AND BOND PER NOTE 9

(ZONE 6F)

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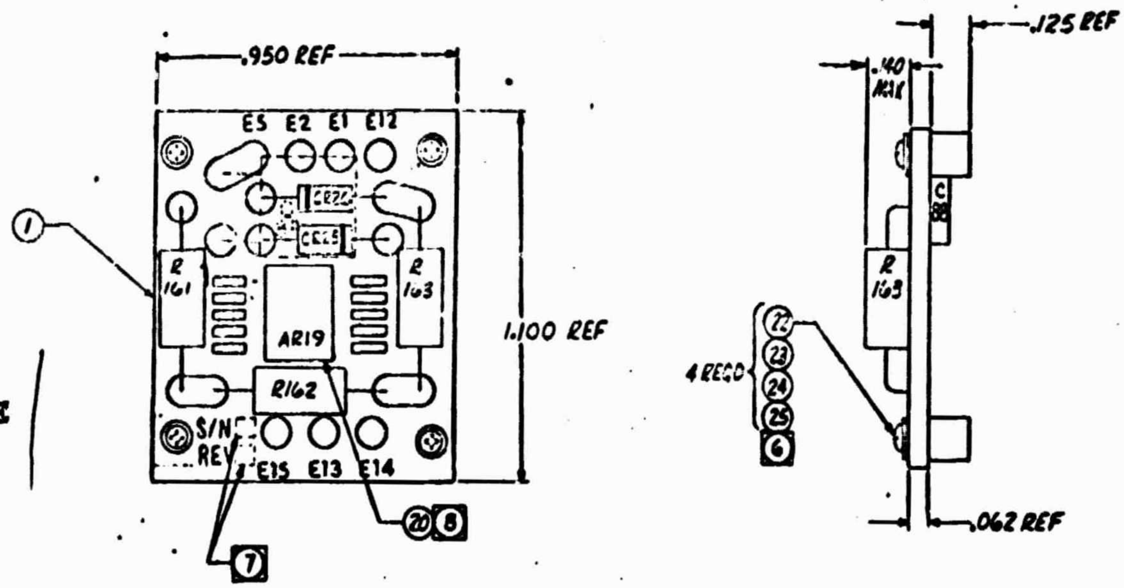
FOLDOUT FRAME



ORIGINAL PAGE IS OF POOR QUALITY

NOTES: UNLESS OTHERWISE SPECIFIED.

1. FOR SCHEMATIC SEE SCH200059.
2. FOR TEST SPEC SEE S200059.
3. CORRELATE REF DESIGNATION TO COMPONENTS BY SEPARATE PARTS LIST PL200357.
4. PARTIAL REF DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATION PREFIX WITH UNIT ASSEMBLY DESIGNATION.
5. SOLDER PER NHB 5300.4(3A-1), USING ITEM 9.
6. TORQUE TO 2.25 ± .25 IN LBS.
7. MARK REV LETTER AND SERIAL NO. PER S40111, CLASS I, TYPE III USING ITEMS 10 & 11.
8. INSTALL ITEM 20 UNDER ALL INTEGRATED CIRCUITS.

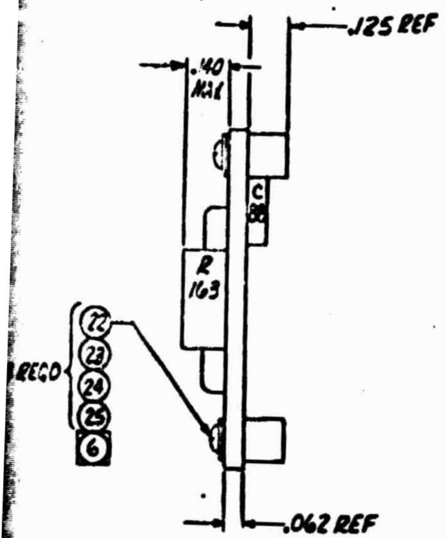
-01

2

1

200357

REVISIONS



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FOR PARTS LIST SEE PL200357

QTY REQD PER NOTED ASSY

CONFIGURATION

LAYOUT NO. L200357

010A

-01 200059 200036

APPLICATION

PART NO. SPECIFICATION NOMENCLATURE OR DESCRIPTION

LIST OF MATERIALS

INTERPRET THIS DRAWING PER STANDARDS

DIMENSIONS ARE IN INCHES

TOLERANCES ON DECIMALS ANGLES

SURFACE ROUGHNESS

PRINTED WIRING BOARD ASSY,
PRE-AMP BUFFER,
VHM

SIZE	CODE IDENT NO	DWG NO
D	13126	200357

SCALE 1/1 SHEET 1 OF 1

2

1

Aerospace Systems Division — Western Laboratories

ENGINEERING ORDER

W L-4-5-A (1-78)

DIST CODE 010A RELEASED SEP 1 1 1981

	JOB NO.	CODE IDENT NO.	
PRINTED WIRING BOARD ASSEMBLY ANALOG VHM	2920	13126	EO — 200357 NC-1

TYPE OF EO		DISPOSITION OF PARTS		
CHANGE		☐ USE	ORIG [signature] DATE 9/10/81	NEXT ASSY 200059
VARIANCE		☒ REWORK	CHECK	MODEL NO.
SUPERSEDING		☐ SCRAP	ENGR [signature] 9-11-81	
NOTED		☐ NOTED BELOW	P.I. [signature]	
			APPR [signature] 9/11/81	OTHER DWG AFFECTED PL200357
			CUSTOMER WPO 9-10-81	

EFFECTIVITY: SN 1 & UP

ECP

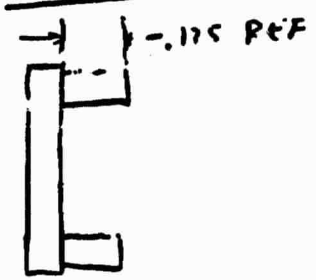
SHT 1 OF 1

DESCRIBE CHANGE AND GIVE REASON: TO ELIMINATE SHORT CIRCUIT AT NEXT ASSY. (CIRCUITRY ON BOARD IS SHORTED BY METAL STANDOFFS)

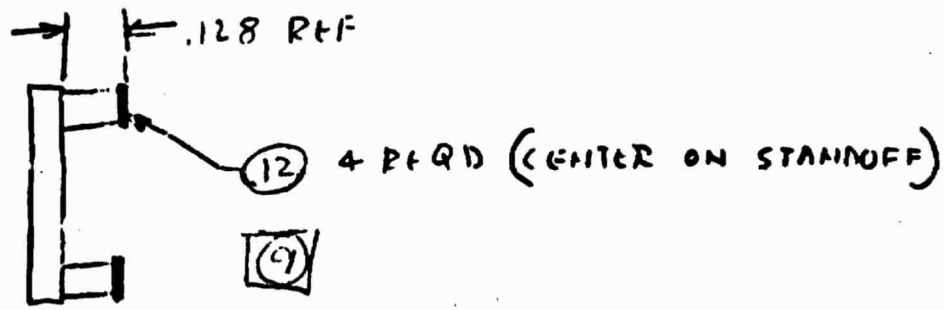
ACTION: ADD INSULATION BETWEEN STANDOFFS AND CIRCUITRY

CHANGE PICTURE ZONE 2C TO ADD ITEMS 12, NOTE $\boxed{9}$, AND REF DIMENSION CHANGE

FROM



TO



ADD NOTE "$\boxed{9}$ BOND INSULATOR TO STANDOFF PER S 43024 TYPE V, USING ITEM 19."

PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	CODE IDENT	ZONE	ITEM NO.

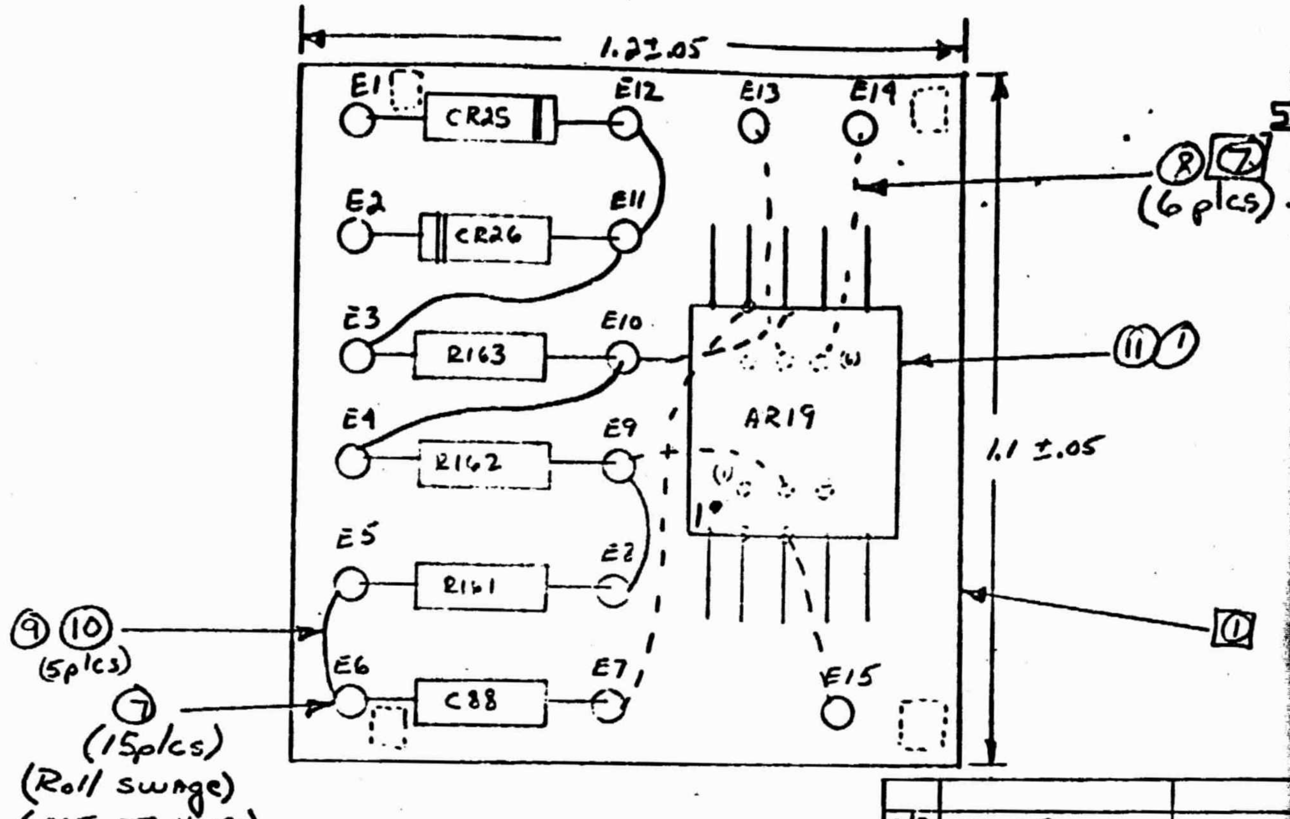
4 | 3 | 2

D

C

B

A



A/R	SN63	
A/R	0151	
A/R	ABLEFILM 517	ABLESTIK
A/R	AMS 3654-22	
A/R	26 AWG, TYPE S	
A/R	168780	
15	2000B-4.5	USECO
1	M39014/01-1339	MIL-C-39014/1
1	RNC55H2003FS	ST11548 MIL-R-55182
1	RNC55H 4992FS	same
1	RNC55H 2001FS	same
2	JANTXV 1N4148	
1	ST11499-LM108AFBR	ST11499
-01	PART NO.	SPECIFICATION

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7. Spot bond as required using item 12. PER WL SPEC. S43024, TYPE V
6. For Test specification see S200059.
5. Terminal locations are approximate locations.
4. Bond AR19 to BRD using item 11.
3. For schematic see SCH200059.
2. Solder per NHB 5300.4(3A-1).
1. Cut from hole/pattern test board manufactured for 390211 70-01.

QTY REQD PER NOTED ASSY

CONFIGURATION

LAYOUT NO.

DIST CODE 010A

DASH NO.	MODEL NO.	NEXT ASSEMBLY	MODEL NO.	FINAL ASSEMBLY	MODEL NO.

APPLICATION

INTERPRET THIS DRAWING PER STANDARDS IN MIL-D-1000

DIMENSIONS ARE IN INCHES

TOLERANCES ON

DECIMALS: X ± .1, XX ± .03, XXX ± .010

ANGLES ± 0° 30'

SURFACE ROUGHNESS

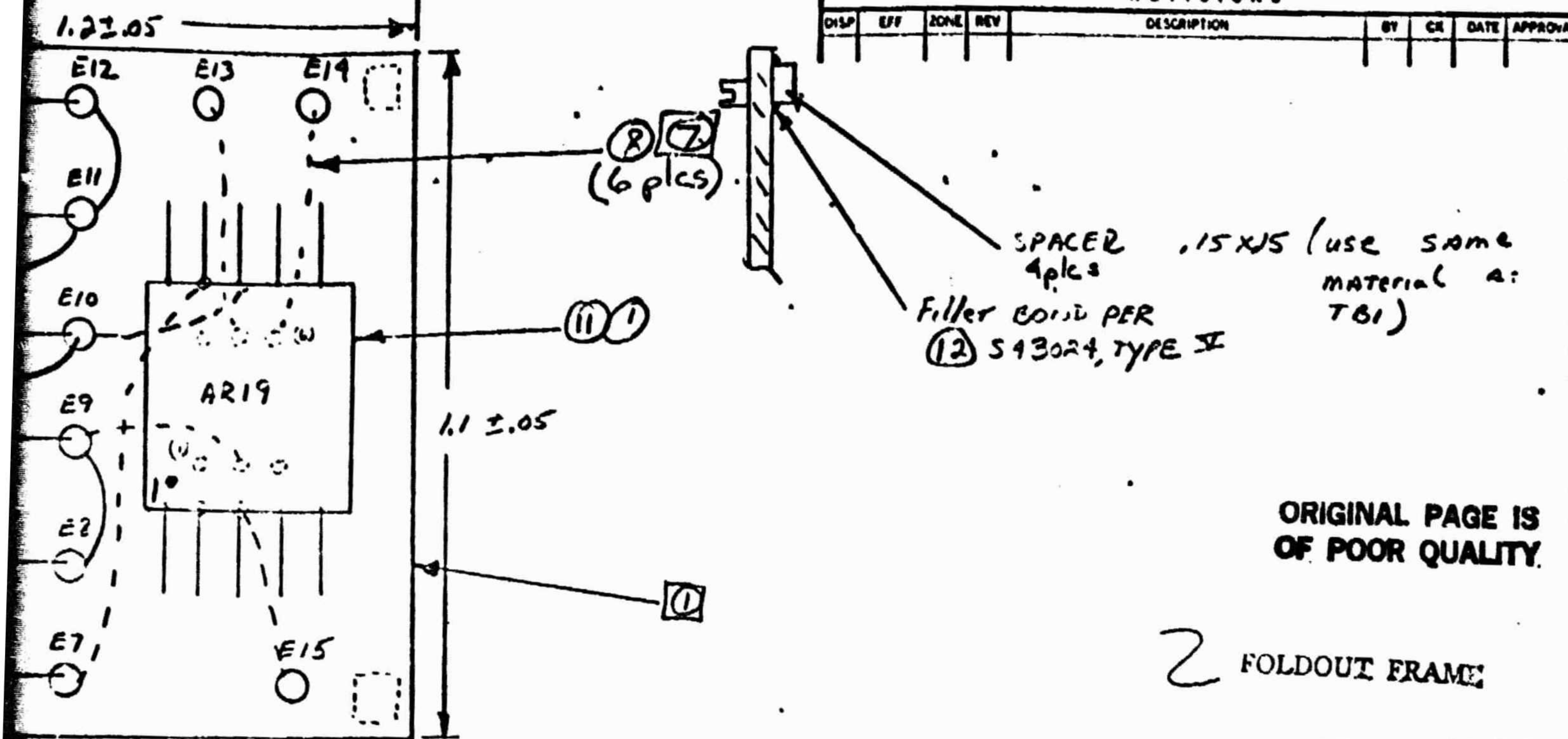
HOLE DIA.	TOLERANCE
.0135 THRU .125	+ .004 − .001
.126 THRU .250	+ .005 − .001
.251 THRU .500	+ .006 − .001
.501 THRU .750	+ .008 − .001
.751 THRU 1.000	+ .010 − .001
1.001 THRU 2.000	+ .012 − .001
2.001 AND OVER	LINEAR

4 | 3 | 2

PARTS DISPOSITION		DWG NO.	REV
1. USE 2. REWORK	3. CANNOT BE REWORKED 4. RECORD	200265	

REVISIONS

DISP	EFF	ZONE	REV	DESCRIPTION	BY	CK	DATE	APPROVAL



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2 FOLDOUT FRAME

12.

9.

-01	PART NO.	SPECIFICATION	NOMENCLATURE OR DESCRIPTION	ELEC REF DES	CODE IDENT	ZONE	ITEM NO.
							14
A/R	SN63		SOLDER				13
A/R	0151		EPOXY PATCH (HYSOL)				12
A/R	ABLEFILM 517	ABLESTIK	TAPE ADHESIVE				11
A/R	AMS 3654-22		Tubing, INSULATION				10
A/R	26 AWG, TYPE S		Buss wire,				9
A/R	168780		Haywire, INSULATED, 32 AWG				8
15	2000B-4.5	USECO	Terminal, Swage				7
1	M39014/01-1339	MIL-C-39014/1	Cap. 100pf ± 200V 10%	C88			6
1	RNC55H2003FS	STNS48 or MIL-R-55182	Resistor, 200K, 1/10 w, ±1%	R164			5
1	RNC55H4992FS	same	Resistor, 49.9K, 1/10 w ±1%	R161			4
1	RNC55H2001FS	same	Resistor, 2K, 1/10w, ±1%	R163			3
2	JANTXV IN4148		DIODE, SIGNAL	CR25 CR26			2
1	ST11499-LM108AFBR	ST11499	Oper Ampl, LM108A	AR19			1

QTY REQD PER NOTED ASSY

LIST OF MATERIALS

CONFIGURATION

LAYOUT NO.

DIST CODE 010A

INTERPRET THIS DRAWING PER STANDARDS IN MIL-D-1000

DIMENSIONS ARE IN INCHES

TOLERANCES ON

DECIMALS: X ±.1, XX ±.03, XXX ±.010

ANGLES ±0° 30'

✓ SURFACE ROUGHNESS

HOLE DIA. TOLERANCE

CONTRACT NO.

DRAWN [illegible] DATE 12-12-80

CHECK

MECH ENG

ELEC ENG A.G. 12/11/80

PROJ ENGR

APPR

DESIGN ACTIVITY APPD

CUSTOMER

Aerospace Systems Division — Western Laboratories

TITLE Terminal Assembly (TB1) Analog

I-PM - VHM

SIZE	CODE IDENT NO.	DWG NO.	REV
C	13126	200265	

SCALE | RELEASED | SHEET OF

NEXT ASSEMBLY | MODEL NO. | FINAL ASSEMBLY | MODEL NO.

APPLICATION

W L-4-5-A (1-78)

Aerosp[illegible] Systems Division — Western Laboratories

ENGINEERING ORDER

DIST CODE 010H RELEASED

[illegible]	JOB NO.	CODE IDENT NO.	
TERMINAL ASSY (TBI) ANALOG ISPM - VHM	2920	13126	EO — 200265 NC-1

TYPE OF EO	DISPOSITION OF PARTS				
CHANGE	☒ USE	ORIG [signature]	DATE 28APR81	NEXT ASSY 200059	EFFECTIVITY
VARIANCE	☒ REWORK	CHECK WPB	4-30-81	MODEL NO.	SN1 & UP
SUPERSEDING	☐ SCRAP	ENGR			
		P&D D. [signature]	5-4-81		
NOTED	☐ NOTED BELOW	APPR [signature]	5-4-81	OTHER DWG AFFECTED NONE	ECP
		CUSTOMER WPB	5-4-81		SHT 1 OF 1

DESCRIBE CHANGE AND GIVE REASON:

DWG ERROR

1. IN L/M-ITEM#5, ELEC REF DES WAS: R164 IS: R162

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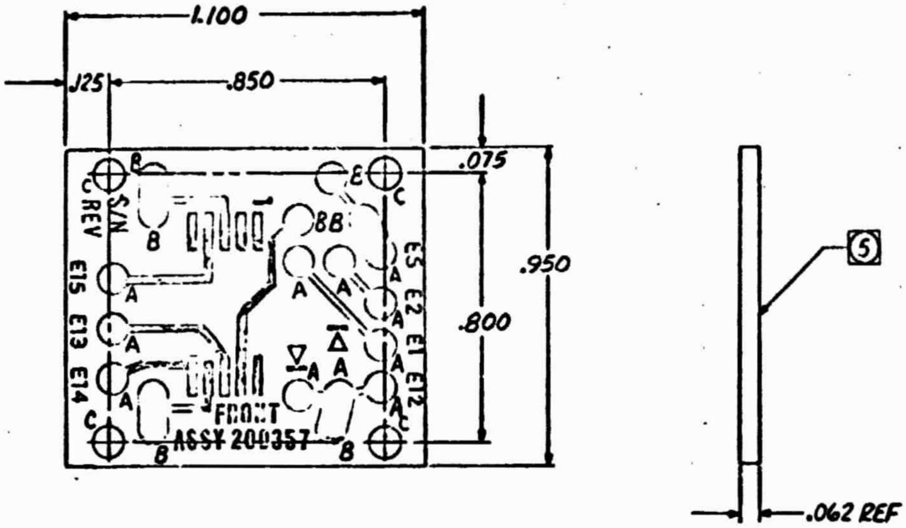
PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	CODE	ZONE	ITEM NO.



FOLDOUT FRAME

HOLE LEGEND			
CODE	HOLE DIA	QTY	PLATED THRU
A	.025	11	NO
B	.031	8	NO
C	.093	4	NO

NOTES: UNLESS OTHERWISE SPECIFIED

1. BASE MATERIAL: COPPER CLAD LAMINATED PLASTIC SHEET SHEET PER MIL-P-13949, TYPE: FL-GF-062-C-1/0A2C.
2. FABRICATE PER S43041, TYPE 2, CLASS I.
3. FOR SCHEMATIC SEE SCH200059.
4. ETCH COPPER USING FULL SCALE FILM POSITIVE OF PC200358, LAYER 1, REV: NC.
5. MARK PART NO. & REVISION LETTER PER S40111, CLASS III, TYPE III USING ITEMS 8 & 9.
6. BREAK ALL SHARP EDGES

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-11

2 1

PARTS DISPOSITION	DWG NO. 200358

REVISIONS

DISP	EFF	ZONE	REV	DESCRIPTION	BY	CK	DATE	APPROVAL

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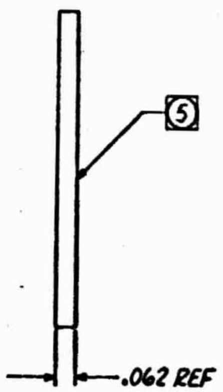


FOLDOUT FRAME

HOLE LEGEND		
HOLE DIA	QTY	PLATED THRU
.025	11	NO
.031	8	NO
.093	4	NO

	QTY	PART NO.	SPECIFICATION	NOMENCLATURE OR DESCRIPTION	ELEC REF DES	CODE IDENT	ZONE	ITEM NO.
	AR	50,000 SERIES	WORNOW PROCESS PAINT CO.	CATALYST, NO.9				9
	AR	50,000 SERIES		CAT-L-INK, EPOXY				8
5	REF		S40111	SPEC, IDENTIFICATION				7
2	REF		S43041	SPEC, FABRICATION				6
								5
								4
	REF	PL200358		ARTWORK				3
								2
1	1		MIL-P-13949	PRINTED WIRING BOARD				1
	-11							

QTY REQD PER NOTED ASSY — LIST OF MATERIALS

CONFIGURATION: LAYOUT NO. L200357; DIST CODE 010A

INTERPRET THIS DRAWING PER STANDARDS IN MIL-D-1000
DIMENSIONS ARE IN INCHES
TOLERANCES ON DECIMALS / ANGLES
SURFACE ROUGHNESS

DASH NO.	MODEL NO.	NEXT ASSEMBLY	MODEL NO.	FINAL ASSEMBLY	MODEL NO.
-11		200357		200036	

APPLICATION

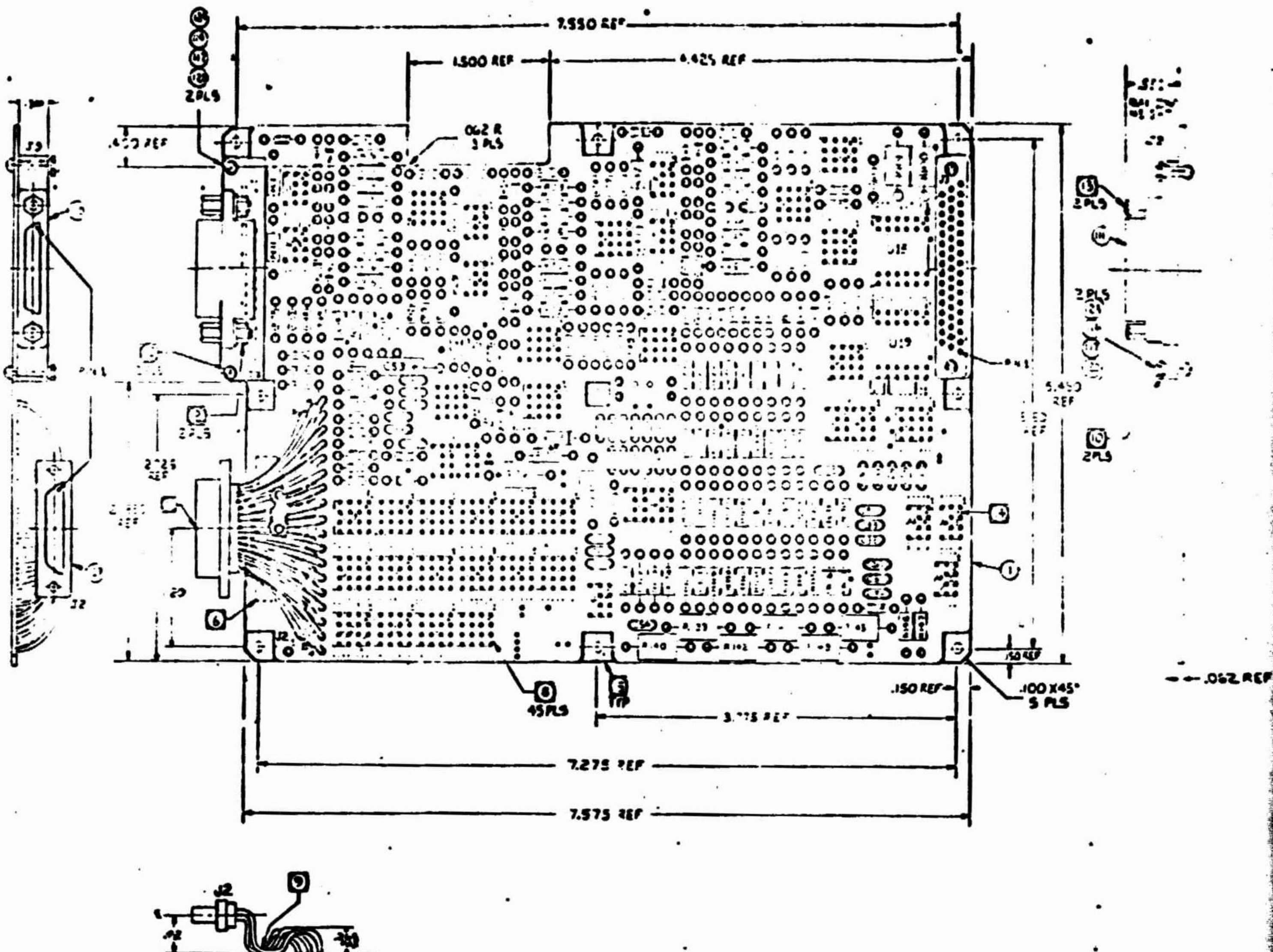
Bell Aerospace Research Corporation

TITLE: PRINTED WIRING BOARD-PRE-AMP BUFFER, VHM

SIZE	CODE IDENT NO	DWG NO.	REV
D	13126	200358	

SCALE 4/1 RELEASED SHEET 1 OF 1

2 1



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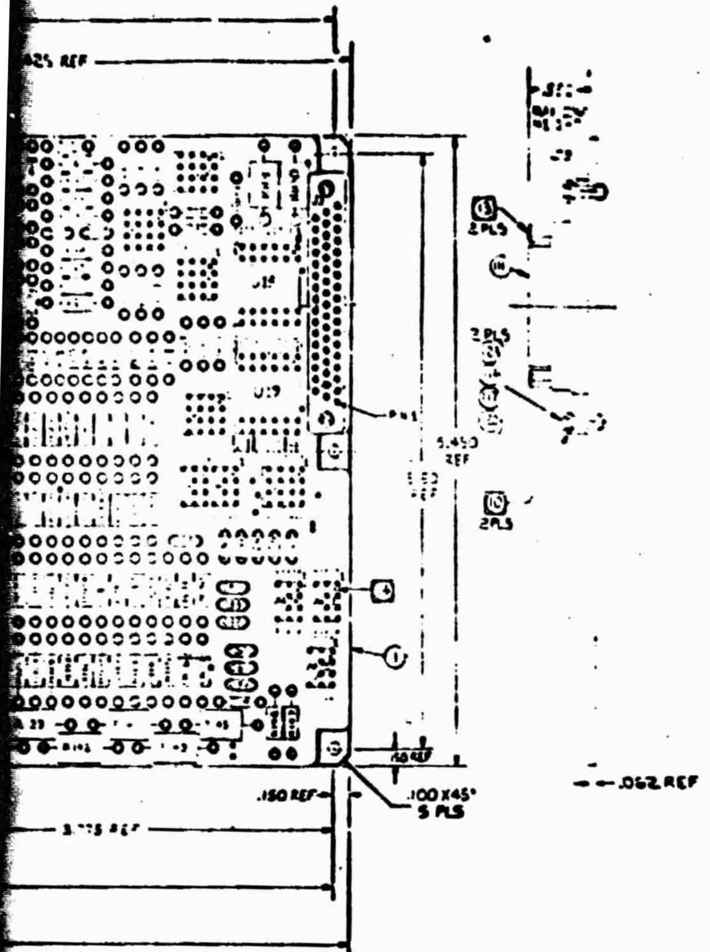
OF POOR QUALITY

15. DO NOT CONFORMAL COAT MOUNTING PADS (BOTH SIDES OF BOARD).
14. PIN 1 IS INDICATED WITH DOT ON I.C.'S.
13. TORQUE JACKSCREWS OF CONNECTOR J9, TO 4.0 IN. LBS ±0.5 IN.LB..
12. TORQUE JACKSCREWS OF CONNECTOR J3, TO 2.0 IN.LBS ±0.5 IN.LB..
11. LINE UP CENTERLINE OF CONNECTOR J2, TO CENTER LINE OF BOARD MOUNTING HOLE.
10. TORQUE ITEMS NO.123 & 124, TO 2.5 IN LBS., ±0.5 IN.LB..
9. BOND WIRES TO BOARD PER S43024, TYPE II USING ITEM 136.
8. APPLY ITEM 137 UNDER ALL INTEGRATED CIRCUITS, CURE AT 150°F FOR 3 HRS.
7. CONFORMAL COAT PER S43028, TYPE V, CLASS E USING ITEM 141.
6. MARK SERIAL NO AND REVISION LETTER PER S40111, CLASS 2, TYPE II USING ITEMS 138 & 139.
5. SOLDER PER NHB 5300.4 3A-1, USING ITEM NO. 147.
4. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATION PREFIX WITH UNIT ASSEMBLY DESIGNATIONS.
3. CORRELATE REFERENCE DESIGNATIONS BY SEPARATE PARTS LIST PL200061
2. FOR TEST SPEC. SEE S200061
1. FOR SCHEMATIC SEE SCH 200061

NOTES: UNLESS OTHERWISE SPECIFIED

FOLDOUT FRAME



MAR 10 1982

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DO NOT CONFORMAL COAT MOUNTING PADS (BOTH SIDES OF BOARD).

PIN 1 IS INDICATED WITH DOT ON I.C.'S.

TORQUE JACKSCREWS OF CONNECTOR J9, TO 4.0 IN.LBS ±0.5 IN.LB..

TORQUE JACKSCREWS OF CONNECTOR J3, TO 2.0 IN.LBS ±0.5 IN.LB..

LINE UP CENTER LINE OF CONNECTOR J2,
TO CENTER LINE OF BOARD MOUNTING HOLE.

TORQUE ITEMS NO.123 & 124, TO 2.5 IN LBS., ±0.5 IN.LB..

BOND WIRES TO BOARD PER 543024, TYPE II, USING ITEM 136.

APPLY ITEM 137 UNDER ALL INTEGRATED CIRCUITS, CURE AT 150°F FOR 3 HRS.

7 CONFORMAL COAT PER 543028, TYPE II, CLASS I USING ITEM 141.

MARK SERIAL NO AND REVISION LETTER
PER 540111 CLASS 2, TYPE II USING ITEMS 138 & 139.

5. SOLDER PER NHB 5300.4 3A-1, USING ITEM NO. 147.

4. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE
DESIGNATION PREFIX WITH UNIT ASSEMBLY DESIGNATIONS.

3. CORRELATE REFERENCE DESIGNATIONS BY
SEPARATE PARTS LIST PL200061

2. FOR TEST SPEC. SEE S200061

1. FOR SCHEMATIC SEE SCH 200061

NOTES: UNLESS OTHERWISE SPECIFIED

FOR PARTS LIST SEE: PL 200061

L200061

PRINTED WIRING BOARD
ASSEMBLY,
DIGITAL VHM

E 13126 200061 A

Aerospace Systems Division | Western Laboratories

W L-4-5-A (1-78)

JAN 06 '81

ENGINEERING ORDER

DIST CODE 010 A

RELEASED

DRAWING TITLE	JOB NO.	CODE IDENT NO.	
PRINTED WIRING BOARD ASSEMBLY DIGITAL. VHM	2920	13126	EO — 200061 NC-1

TYPE OF EO	DISPOSITION OF PARTS			
[ ] CHANGE	[ ] USE	ORIG P. Dyum DATE 12-17-80	NEXT ASSY 200061	EFFECTIVITY SN 1 (PROTO) ONE
[X] VARIANCE	[X] REWORK	CHECK	MODEL NO 200036-01	
[ ] SUPERSEDING	[ ] SCRAP	ENGR 12/17/80		
[ ] NOTED	[X] NOTED BELOW	PM	OTHER DWG AFFECTED SCH 200061	ECP
		APPR 12/17/80		
		CUSTOMER		SHT 1 OF 1

DESCRIBE CHANGE AND GIVE REASON:

INSTALL AND SOLDER A HAYWIRE (32 AWG INSULATED), (168780) ON THE FARSIDE OF THE PWB, FROM J9-44 (FEED THRU), TO U7-13 (FEED THRU).

2. SPOT BOND HAYWIRE AS REQUIRED USING ITEM 136.

ORIGINAL PAGE IS OF POOR QUALITY

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REASON FOR ABOVE: REQUIRED DESIGN ENGINEERING CHANGES.

	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES		ITEM NO

REASON FOR ABOVE: REQUIRED DESIGN [illegible]

NOTE	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	SH	ITEM NO

Aerospace Systems Division · Western Laboratories

ENGINEERING ORDER

DIST CODE 010 A

W 2-4-3-A (1-70)

RELEASED MAR 23 '81

TITLE	JOB NO.	CODE IDENT NO.	
PRINTED WIRING BOARD DIGITAL ASSEMBLY VHM	2920	13126	EO — 200061 NC-3

TYPE OF EO	DISPOSITION OF PARTS			
CHANGE	☐ USE	ORIG JARAMILLO DATE 3-20-81	NEXT ASSY 200061	EFFECTIVITY
VARIANCE	☒ REWORK	CHECK DA	MODEL NO. 200036-01	SN 1 (PROTO) ONLY
SUPERSEDING	☐ SCRAP	ENGR [signature] 3-20-81		
[illegible]IED	☐ NOTED BELOW	PM [signature] 3-20-81	OTHER DWG AFFECTED SCH200061	ECP
		APPR [signature]		
		CUSTOMER		SHT 1 OF 1

DESCRIBE CHANGE AND GIVE REASON: CONNECT SET AND RESET TO GROUND

INSTALL AND SOLDER A HAYWIRE (32 AWG INSULATED)
168780
TOPSIDE FROM U24-8 TO U24-4, 7.

SPOT BOND HAYWIRE AS REQUIRED USING
ITEM 136

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OF POOR QUALITY

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IDENTIFICATION	DESCRIPTION	ELECT REF DES	ZONE	ITEM NO.

Aerospace Systems Division — Western Laboratories

ENGINEERING ORDER

W L-4-5-A (1-78)

DIST CODE 010A — RELEASED

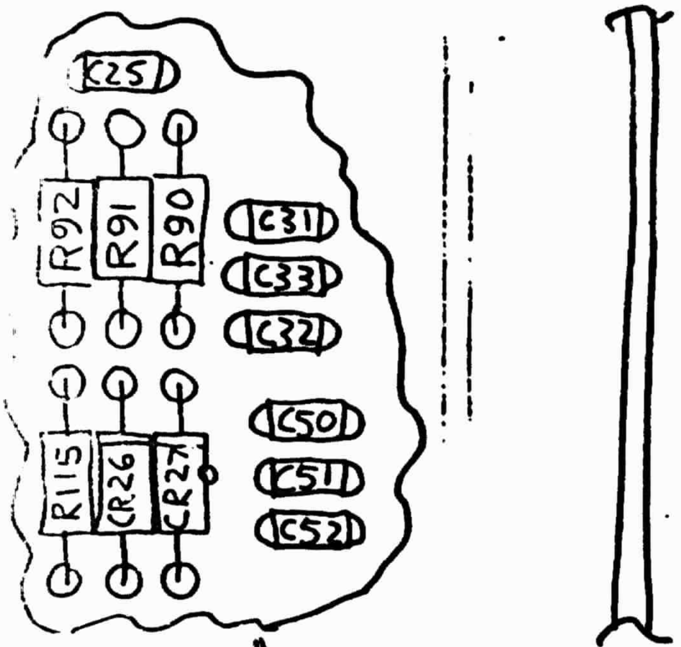
TITLE	JOB NO.	CODE IDENT NO.	
PRINTED WIRING BOARD ASSY DIGITAL, VHM	2920	13126	EO — 200061 A-1

TYPE OF EO	DISPOSITION OF PARTS			
CHANGE	☒ USE	ORIG [signature] DATE 7/7/81	NEXT ASSY 200856	EFFECTIVITY
VARIANCE	☐ REWORK	CHECK W P B S 7-20-81	MODEL NO.	SN 1 & UP
SUPERSEDING	☐ SCRAP	ENGR [signature]		
NOTED	☐ NOTED BELOW	PM [signature] 7/13/81		
		APPR [signature] 7/17/81	OTHER DWG AFFECTED PL 200061 SCH 200061	ECP
		CUSTOMER W P B S 7-20-81		SHT 1 OF 1

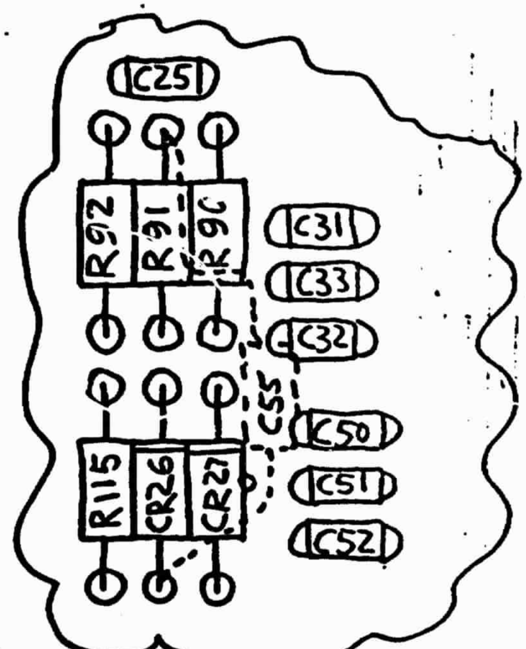
DESCRIBE CHANGE AND GIVE REASON: ENGINEERING REQUEST - ADD CAPACITOR C55, BONDING NOTE SLEEVING

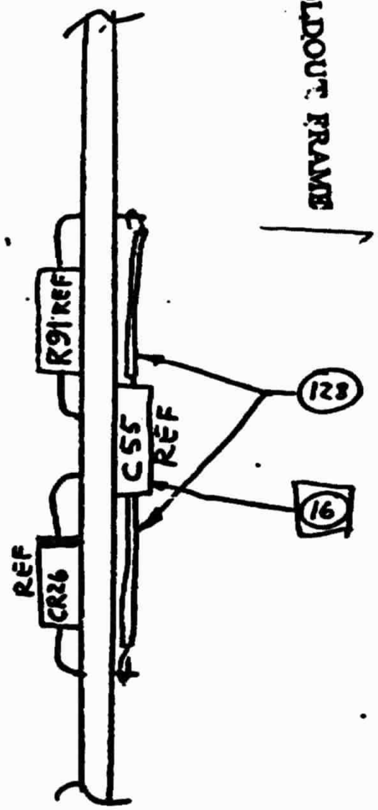
ZONE 5E/4E ADD CAP C55 - CHANGE F/D

FROM



TO





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ADD NOTE "16 BOND C55 TO BOARD PER S43024, TYPE V, USING ITEM 136."

QTY REQ	NOTED ASSY	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	CODE IDENT	ZONE	ITEM NO.

QTY REQ'D	NOTED ASSY	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	CODE IDENT	ZONE	ITEM NO.

W L-4-5-A (1-78)

Aerospace Systems Division — Western Laboratories

ENGINEERING ORDER

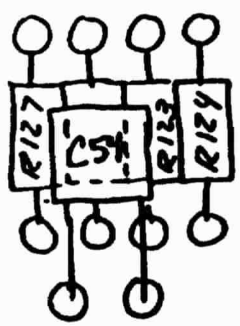
DIST CODE 010A RELEASED JUL 24 1981

DRAWING TITLE	JOB NO.	CODE IDENT NO.	
PW BOARD ASSY - DIGITAL VHM	2920	13126	EO — 200061 A-2

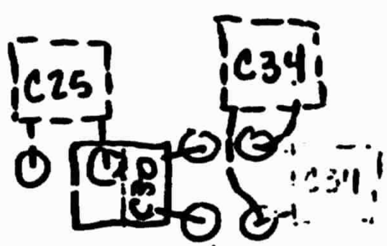
TYPE OF EO	DISPOSITION OF PARTS			
CHANGE	☐ USE	ORIG WPBJ DATE 7-22-81	NEXT ASSY 200056	EFFECTIVITY SN 1 & UP
VARIANCE	☒ REWORK	CHECK WPBJ 7-22-81	MODEL NO.	
SUPERSEDING	☐ SCRAP	ENGR [illegible] 7-21-81		
NOTED	☐ NOTED BELOW	PM [illegible] 7/23/81		ECP
		APPR [illegible] 7/23/81	OTHER DWG AFFECTED	
		CUSTOMER WPBJ 7-23-81		SHT 1 OF 1

DESCRIBE CHANGE AND GIVE REASON: INTEFERENCE WITH ANALOG BOARD

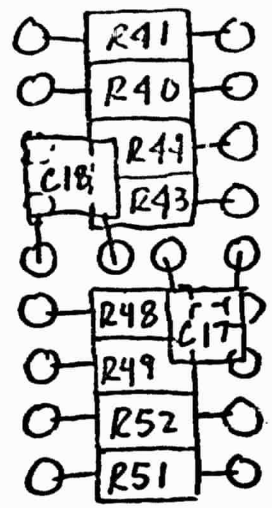
1. IN ZONE 6E
LAY C54 DOWN AS SHOWN BELOW.
SLEEVE LEADS WITH ITEM 128 A/R.



2. IN ZONE 5F
MOVE C25 & C34 TO FAR SIDE AND LAY DOWN,
LAY C30 DOWN NEAR SIDE AS SHOWN BELOW.
SLEEVE LEADS WITH ITEM 128 A/R.



3. IN ZONE 6G
LAY C17 & C18 DOWN AS SHOWN BELOW.
SLEEVE LEADS WITH ITEM 128 A/R.



2 FOLDOUT FRAME

Aerospace Systems Division   Western Laboratories

W 2-4-5-A (1-78)

ENGINEERING ORDER

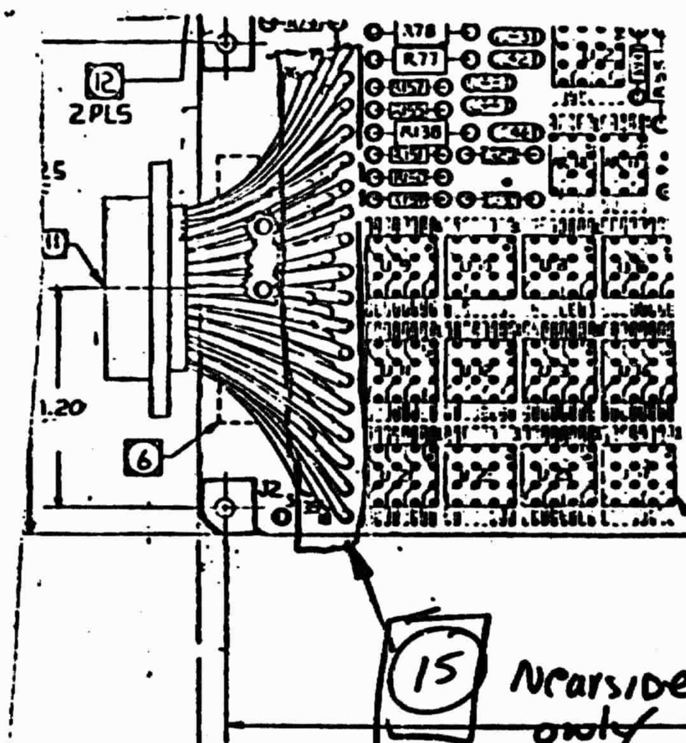
DIST CODE 010A   RELEASED AUG ...

DRAWING TITLE	JOB NO.	CODE IDENT NO.	
PW BOARD ASSY - DIGITAL VHM	2920	13126	EO — 200061 A-3

TYPE OF EO	DISPOSITION OF PARTS			
☒ CHANGE	☐ USE	ORIG WPBJ DATE 8-25-81	NEXT ASSY 200056	EFFECTIVITY SN 1 & UP
☐ VARIANCE	☒ REWORK	CHECK WPBJ 8-25-81	MODEL NO.	
☐ SUPERSEDING	☐ SCRAP	ENGR 8-25-81		ECP
☐ NOTED	☐ NOTED BELOW	PM	OTHER DWG AFFECTED 200056	SHT 1 OF 1
		APPR		
		CUSTOMER WPBJ 8-25-81		

DESCRIBE CHANGE AND GIVE REASON:

1. IN ZONE 2B ADD 15 NEARSIDE ONLY AS SHOWN BELOW
2. IN ZONE 7C DELETE 9 AS SHOWN BELOW



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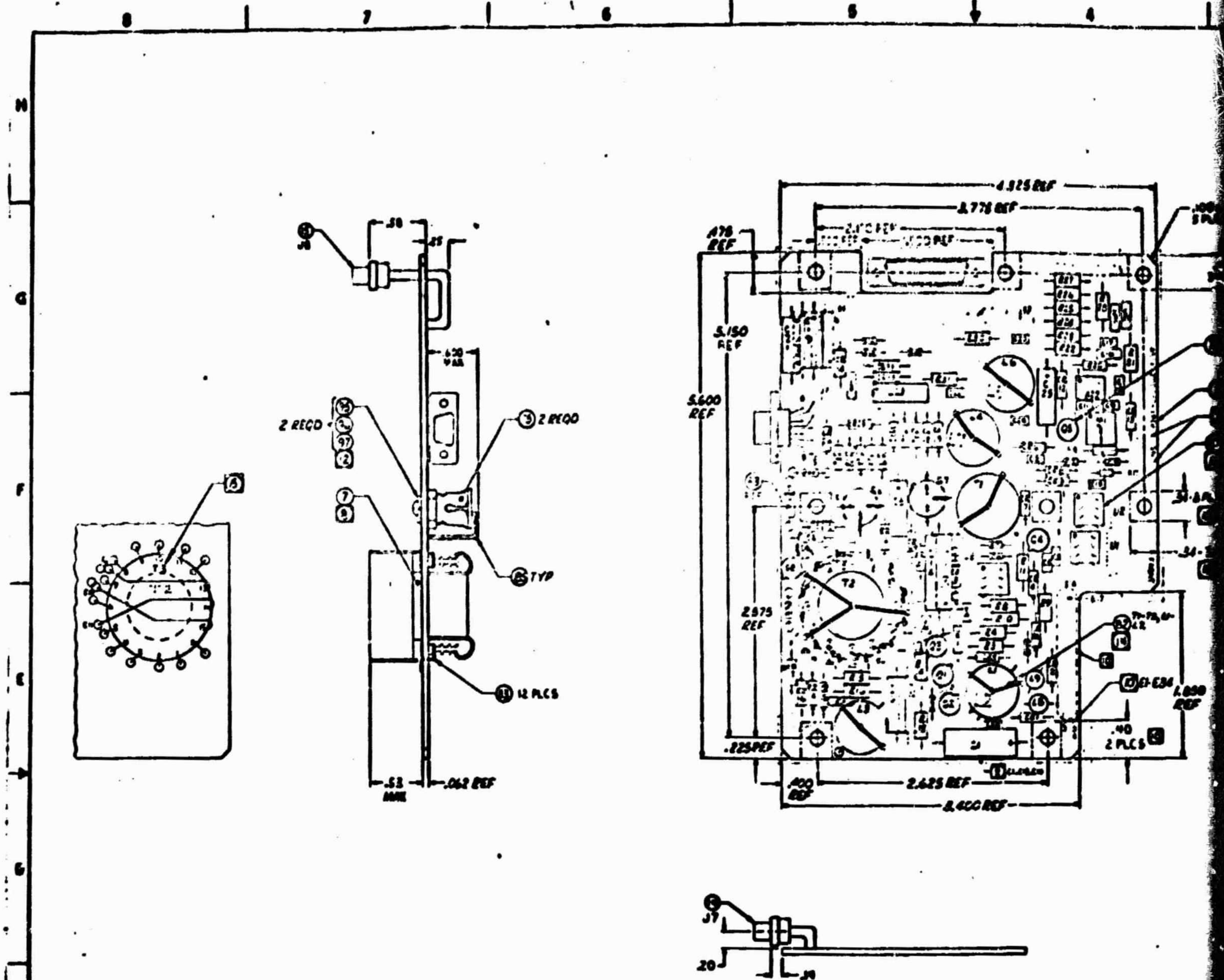
QTY REQ	NEXT ASSY	PART NO.	SPECIFICATION	DESCRIPTION	REF DES	CODE IDENT	ZONE	ITEM NO.



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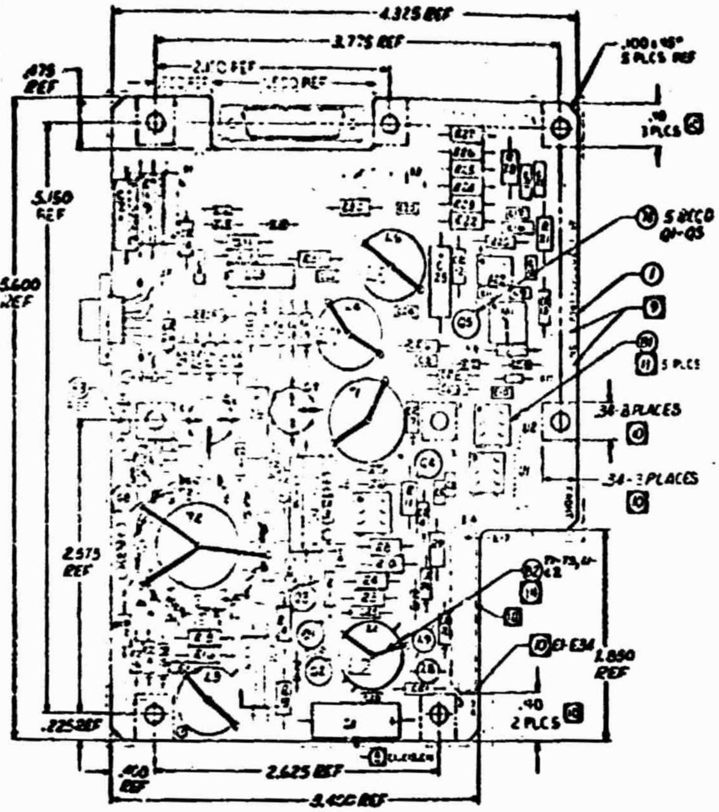
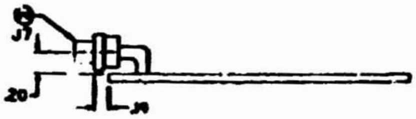
FOLDOUT FRAME

15. WIND TWO (2) TURNS ON T3-3, -5. ENGR WILL DETERMINE DIRECTION OF WINDING, SPOT BOND PER S43024, TYPE I, USING ITEM 79.
14. FILLET T1-T3 AND L1-L7 ALL AROUND PER NOTE 8.
13. INSTALL C7, C8, C26, C27, L4, L5, L7, C29, C78 ON FARSIDE OF BOARD.
12. TORQUE HARDWARE FOR Q6 AND Q7 TO 5.2 ± 0.5 IN LBS.
11. INSTALL ITEM 81 UNDER ALL INTEGRATED CIRCUITS.
10. DO NOT CONFORMAL COAT THIS AREA REARSIDE & FARSIDE.
9. MARK REV LETTER AND SERIAL NO. PER S40??, CLASS III, TYPE II, USING ITEMS 76 & 77.
8. SPOT BOND PER S43024, TYPE I, USING ITEM 79.
7. SCREEN PARTS AS REQD PER S200070.
6. CONFORMAL COAT PER S43020, CLASS II, TYPE I, CURE A OR B.
5. SOLDER PER NHB 5300.4(3A-1), USING ITEM 80.
4. PARTIAL REF DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATION PREFIX WITH UNIT ASSEMBLY DESIGNATION.
3. CORRELATE REF DESIGNATION TO COMPONENTS BY SEPARATE PARTS LIST PL200050.
2. FOR TEST SPEC SEE S200050.
1. FOR SCHEMATIC SEE DWG SC-200050.

NOTES: UNLESS OTHERWISE SPECIFIED





WIRE LIST		
FROM	TO	WIRE
E1	E2	73
E3	E4	73
T3-13	E9	
T3-14	E11	
T3-15	E10	

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2 FOLDOUT FRAME

WIND TWO (2) TURNS ON T3-3,-5. ENGR WILL DETERMINE DIRECTION OF WINDING. SPOT BOND PER S43024, TYPE I, USING ITEM 79.
FILLET T1-T3 AND L1-L7 ALL AROUND PER NOTE 8.
INSTALL C?, C13, C26, C27, L2, L5, L7, C29, C78 ON FARSIDE OF BOARD.
TORQUE HARDWARE FOR CANNON STAND 5.2 ± 0.5 IN LBS.
INSTALL ITEM 81 UNDER ALL INTEGRATED CIRCUITS.
DO NOT CONFORMAL COAT THIS AREA NEARSIDE & FARSIDE.
MARK REV LETTER AND SERIAL NO. PER S40111, CLASS III, TYPE II, USING ITEMS 76 & 77.
SPOT BOND PER S43024, TYPE I, USING ITEM 79.
SCREEN PARTS AS RECD PER S 200070.
CONFORMAL COAT PER S43028, CLASS II, TYPE I, CURE A OR B.
SOLDER PER NHB 5300.4(3A-1), USING ITEM 80.
PARTIAL REF DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATION PREFIX WITH UNIT ASSEMBLY DESIGNATION.
CORRELATE REF DESIGNATION TO COMPONENTS BY SEPARATE PARTS LIST PL 200050.
FOR TEST SPEC SEE S200050.
FOR SCHEMATIC SEE DWG SK-200050.

FOR PARTS LIST SEE PL200050

LIST OF MATERIALS

L200050

PRINTED WIRING BOARD ASSY L.V.P.S.

13126 200050

W 1-4-5-A (1-78)

Ball Aerospace Systems Division — Western Laboratories

ENGINEERING ORDER

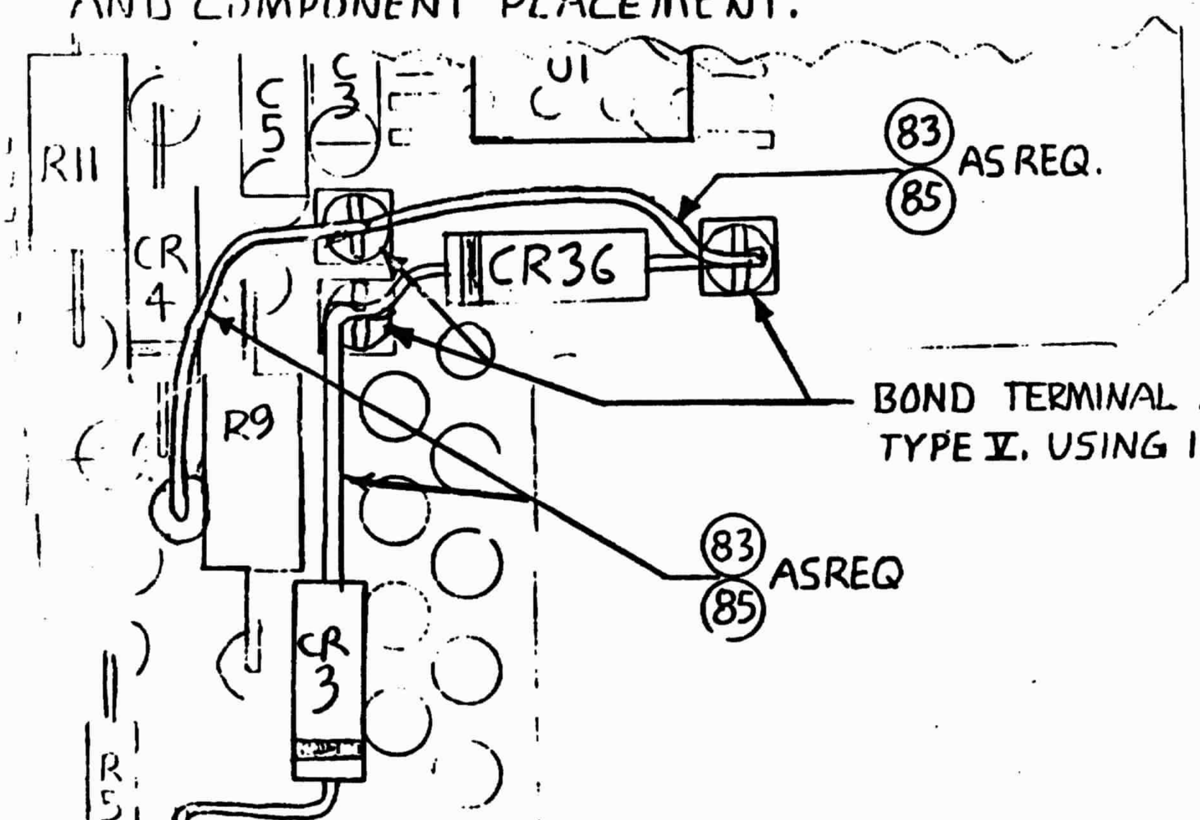
DIST CODE 010 RELEASED

DRAWING TITLE: PWB-ASSEMBLY-LVPS VHM 200050-01	JOB NO. 2920	CODE IDENT NO. 13126	EO — 200050- NC-1

TYPE OF EO	DISPOSITION OF PARTS			EFFECTIVITY
☐ CHANGE	☐ USE	ORIG PILGRIM DATE 10/14/80	NEXT ASSY 200056-01	SN 1 ONLY
X VARIANCE	☒ REWORK	CHECK 10/16/80	MODEL NO.	
☐ SUPERSEDING	☐ SCRAP	ENGR 10/16/80		ECP
☐ NOTED	☒ NOTED BELOW	PJ 10-17-80	OTHER DWG AFFECTED SCH200050 PL200050	
		APPR 10/17/80		
		CUSTOMER 10-12-80		SHT 1 OF 2

DESCRIBE CHANGE AND GIVE REASON:

THIS VARIANCE E.O., EFFECTS 200050-01 SERIAL # 1 ONLY. SUBSEQUENT EDITIONS, SHALL HAVE INTERNAL UPDATED CIRCUITRY, AND COMPONENT PLACEMENT.



2. ADD CR36, SIGNAL DIODE, P.N. ST11330-FDS643, (ITEM 16).
3. INSTALL CR36 AS SHOWN.
4. USE INSULATION ON 26AWG WIRE AS NEEDED.

BOND TERMINAL ASSY. TO BOARD PER S43024, TYPE V. USING ITEM 79. FILLET ALL AROUND.

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PART NO.	SPECIFICATION	DESCRIPTION

Ball Brothers Research Corporation

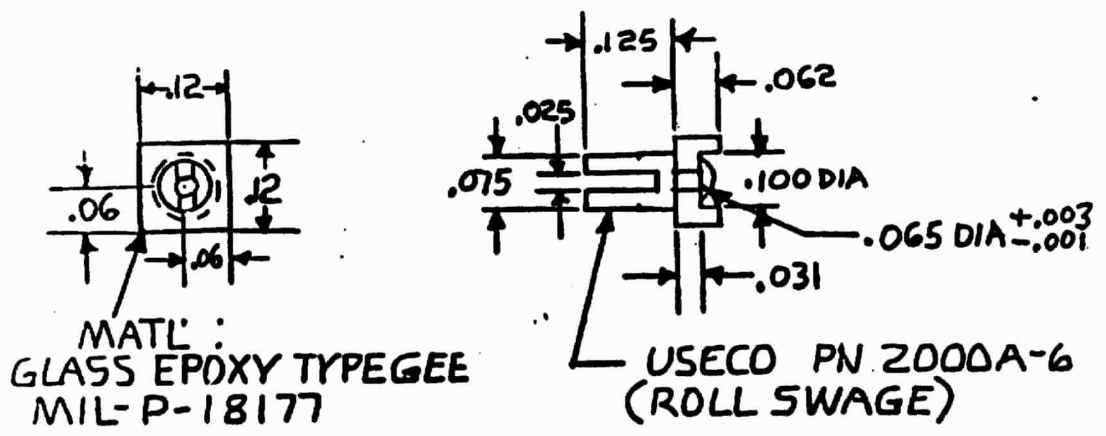
ENGINEERING ORDER

DIST CODE 01d — RELEASED OCT 23 '80

	JOB NO.	CODE IDENT NO.	
PWB ASSY LVPS VHM 200050	2920	13126	EO — 200050-NC1

SHT 2 OF 2

5. MAKE 3: TERMINALS AS SHOWN BELOW:



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W L-4-5-A (1-78)

Aerospace Systems Division — Western Laboratories

ENGINEERING ORDER

DIST CODE A 010 — RELEASED [illegible] 81

DRAWING TITLE	JOB NO.	CODE IDENT NO	
PRINTED WIRING BOARD LUPS, UHM	2920	13126	EO — 200050 NC-2

TYPE OF EO	DISPOSITION OF PARTS			EFFECTIVITY
[ ] CHANGE	[ ] USE	ORIG Jaram. [illegible] DATE 2-3-81	NEXT ASSY 200050	SN 1 only
[X] VARIANCE	[X] REWORK	CHECK	MODEL NO. 200036-01	
[ ] SUPERSEDING	[ ] SCRAP	ENGR D. D. [illegible] 2-3-81		ECP
[ ] NOTED	[X] NOTED BELOW	PM [illegible] 2-3-81	OTHER DWG AFFECTED SCH 200050	
		APPR [illegible] 2/3/81		SHT 1 OF 1
		CUSTOMER		

DESCRIBE CHANGE AND GIVE REASON: Inputs To clock of K_2 were reversed

1. Install interrupt pads on U1-3, U1-5 per P.B. 5002

2. Add jumper wires per P.B. 5003
   U3-3 To U1-3
   U2-14 To U1-5

2 FOLDOUT FRAME

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PART NO. | SPECIFICATION | DESCRIPTION | ELECT REF DES | ZONE | ITEM NO.

Aerospace Systems Division — Western Laboratories

W L-4-5-A (1-78)

ENGINEERING ORDER

DIST CODE 010 A — RELEASED FEB 23 '81

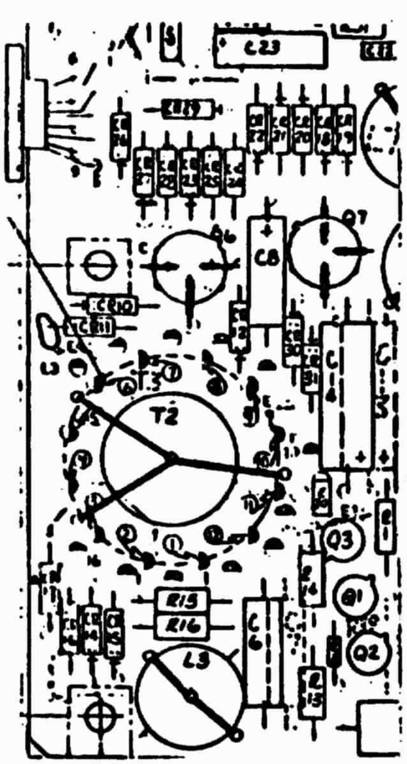
DRAWING TITLE	JOB NO.	CODE IDENT NO.	
PRINTED WIRING BOARD ASSY LVPS VHM	2920	13126	EO — 200050 NC-4

TYPE OF EO	DISPOSITION OF PARTS				
[ ] CHANGE	[X] USE	ORIG Jaramillo	DATE 2-12-81	NEXT ASSY 200050	EFFECTIVITY SN 1 only
[X] VARIANCE	[X] REWORK	CHECK		MODEL NO. 200036-01	
[ ] SUPERSEDING	[ ] SCRAP	ENGR	2-12-81	OTHER DWG AFFECTED PL 200050	ECP
[ ] NOTED	[X] NOTED BELOW	PM	2-12-81		SHT 1 OF
		APPR	2/12/81		
		CUSTOMER			

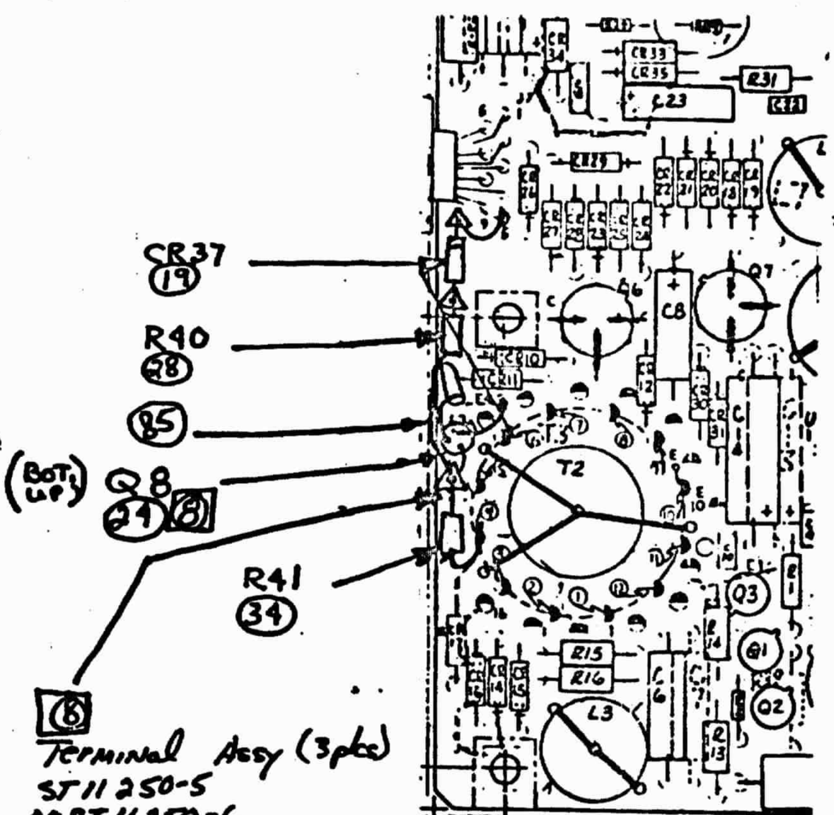
DESCRIBE CHANGE AND GIVE REASON:

ENGR. CHANGE TO correct STARTING PROBLEM.

WAS



IS



ADD:
CR37, R40, R41,
Q8 AS NOTED

WIRE LIST

Q8-C To E3

Q8-E To E4

CR37-C To J7-5

Q8-B To Term. Assy.

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QTY REQD PER NOTED ASSY	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	ZONE	ITEM NO.

ST11250-5
or ST11250-6

QTY REQ'D PER NOTED ASSY	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES		ZONE	ITEM NO.

W L-4-5-A (1-78)

Aerospace Systems Division — Western Laboratories

ENGINEERING ORDER

DIST CODE 010 A — RELEASED APR 24 '81

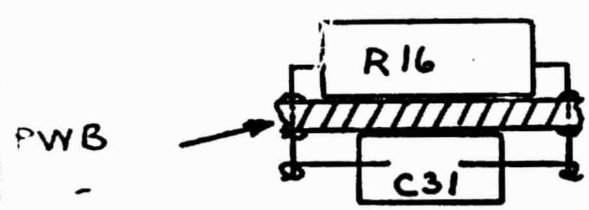
DRAWING TITLE	JOB NO.	CODE IDENT NO.	
PRINTED WIRING BOARD ASSY LVPS VHM	2920	13126	EO — 200050 NC-6

TYPE OF EO	DISPOSITION OF PARTS			EFFECTIVITY
[ ] CHANGE	[ ] USE	ORIG JARAMILLO DATE 4-10-81	NEXT ASSY 200050	SN 1 (PROTO ONLY)
[X] VARIANCE	[X] REWORK	CHECK RL / ENGR W Archin	MODEL NO. 200036-01	
[ ] SUPERSEDING	[ ] SCRAP	PM Dean D. Arleni / APPR [illegible] 4/13/81	OTHER DWG AFFECTED PL 200050	ECP
[ ] NOTED	[ ] NOTED BELOW	CUSTOMER WB 4-15-81		SHT 1 OF 1

DESCRIBE CHANGE AND GIVE REASON:

1) ZONE 5E

ADD C31 AS SHOWN



(SIDE VIEW)

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W 2-4-5-A (1-78)

Aerospace Systems Division — Western Laboratories

ENGINEERING ORDER

DIST CODE 010A RELEASED JUL 24 1981

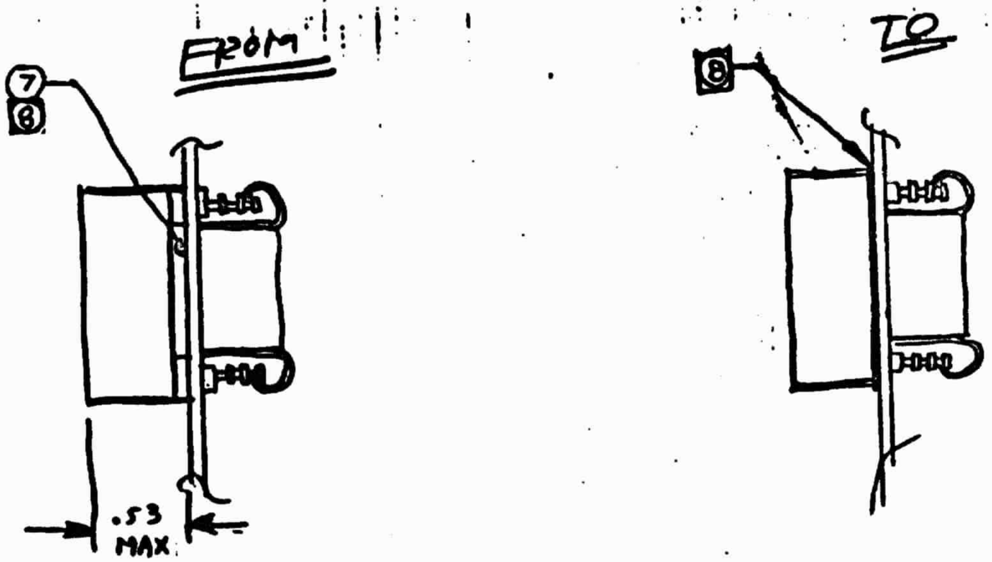
DRAWING TITLE	JOB NO.	CODE IDENT NO.	EO
PRINTED WIRING BOARD ASSY LVPS — VHM	2920	13126	EO — 200050 A-1

TYPE OF EO	DISPOSITION OF PARTS			
[X] CHANGE	[ ] USE	ORIG GAUGHEN DATE 6/30/81	NEXT ASSY 200056	EFFECTIVITY SN-1 & UP
[ ] VARIANCE.	[X] REWORK	CHECK WPBJ 7-21-81	MODEL NO.	
[ ] SUPERSEDING.	[ ] SCRAP	ENGR [illegible] 7-21-8		
[ ] NOTED	[ ] NOTED BELOW	PM [illegible] 7/23/81	OTHER DWG AFFECTED PL 200050	ECP
		APPR [illegible]		
		CUSTOMER WPBJ 7-23-81		SHT 1 OF 1

DESCRIBE CHANGE AND GIVE REASON: PART MUST BE OMITTED TO ACHIEVE .53 DIMENSION

DELETE ITEM 7.

ZONE 7E/7F, CHANGE:



QTY REQ	NOTED ASSY	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	CODE	ZONE	ITEM NO.

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.53 MAX

QTY REQ	NOTED ASSY	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	CODE	ZONE	ITEM NO.

Aerospace Systems Division — Western Laboratories

W L-4-5-A (1-78)

ENGINEERING ORDER

DIST CODE 010A RELEASED JUL 23 1981

DRAWING TITLE	JOB NO.	CODE IDENT NO.	
PW BOARD ASSY - LUPS, VHM	2920	13126	EO — 200050A-2

TYPE OF EO	DISPOSITION OF PARTS			NEXT ASSY 200056	EFFECTIVITY
[X] CHANGE	[ ] USE	ORIG WPBJ	DATE 7-28-81		SN 1 & UP
[ ] VARIANCE	[X] REWORK	CHECK WPBJ	7-28-81	MODEL NO.	
[ ] SUPERSEDING	[ ] SCRAP	ENGR	7-28-81		
		PM	7-23-81		
[ ] NOTED	[ ] NOTED BELOW	APPR		OTHER DWG AFFECTED	ECP
		CUSTOMER			SHT 1 OF 1

DESCRIBE CHANGE AND GIVE REASON:

1. IN ZONE 4F, TAKE C12 OFF FRONT SIDE AND MOUNT ON BACK SIDE OF BOARD (SPOT BOND PER NOTE 8) SLEEVE LEADS WITH ITEM 85

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W L-4-5-A (1-78)

Aerospace Systems Division — Western Laboratories

ENGINEERING ORDER

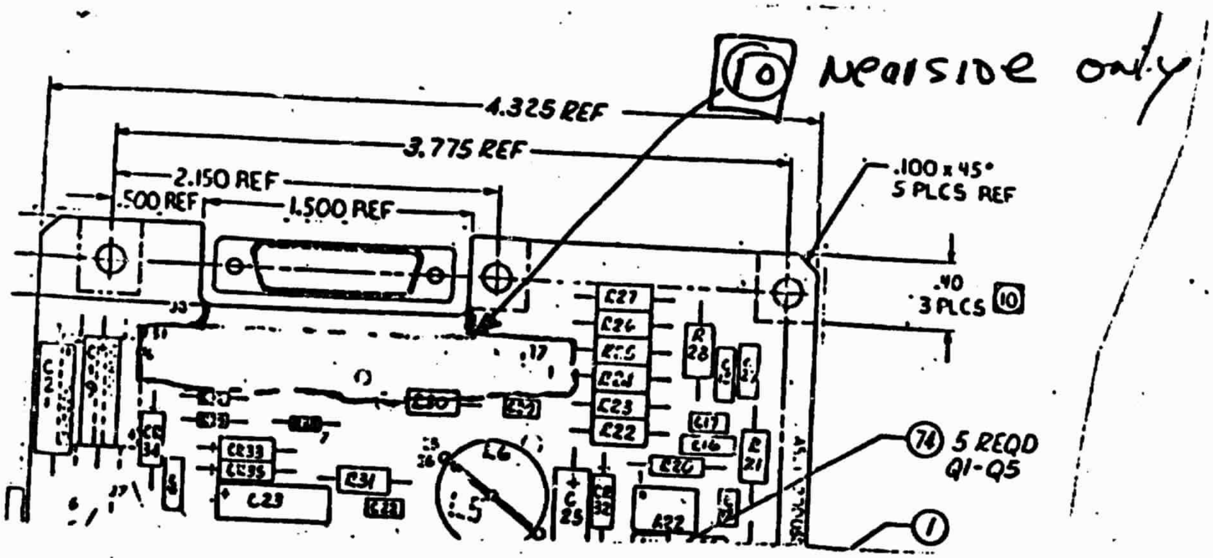
DIST CODE 010A RELEASED AUG 2 5 1981

TITLE	JOB NO.	CODE IDENT NO.	
PW BOARD ASSY - LVPS	2920	13126	EO — 200050 A-3

TYPE OF EO	DISPOSITION OF PARTS				
CHANGE	☒ USE	ORIG WPBJ	DATE 8-25-81	NEXT ASSY 200056	EFFECTIVITY SN1 & UP
VARIANCE	☒ REWORK	CHECK WPDS	8-25-81	MODEL NO.	
SUPERSEDING	☐ SCRAP	ENGR RG	8-25-81		ECP
NOTED	☐ NOTED BELOW	PM [illegible] 8/25/81		OTHER DWG AFFECTED 200056	
		APPR [illegible] 8/25/81			
		CUSTOMER WPDS	8-25-81		SHT 1 OF 1

DESCRIBE CHANGE AND GIVE REASON:

1. IN ZONE 5G ADD $\boxed{10}$ NEARSIDE ONLY AS SHOWN BELOW



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ITEM	ZONE	CODE	ELECT	DESCRIPTION	SPECIFICATION	PART NO.	NEXT ASSY

PART NO.	SPECIFICATION	DESCRIPTION	ELECT	CODE	ZONE	ITEM

Aerospace Systems Division — Western Laboratories

W L-4-5-A (1-78)

ENGINEERING ORDER

DIST CODE 010A   RELEASED DEC 09 1981

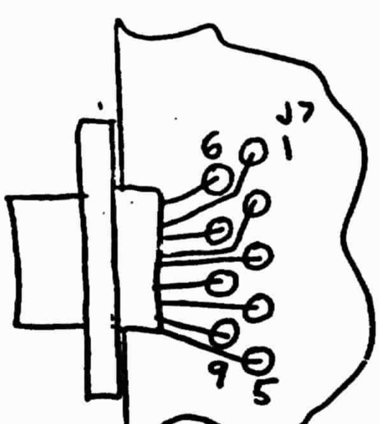
DRAWING TITLE	JOB NO.	CODE IDENT NO.	
PRINTED WIRING BOARD ASSY L.V. P.S. — VHM	2920	13126	EO — 200050A-4

TYPE OF EO	DISPOSITION OF PARTS		NEXT ASSY 200056	EFFECTIVITY
☒ CHANGE	☐ USE	ORIG GAUGHEN DATE 12/8/81		SN 1 & UP
☐ VARIANCE	☒ REWORK	CHECK WPBJ 12-8-81	MODEL NO.	
☐ SUPERSEDING	☐ SCRAP	ENGR D. [illegible] 12-9-81		ECP
☐ NOTED	☐ NOTED BELOW	PM D. A[illegible] 12-9-81	OTHER DWG AFFECTED NONE	SHT 1 OF 1
		APPR [illegible]		
		CUSTOMER WPBJ 12-8-81		

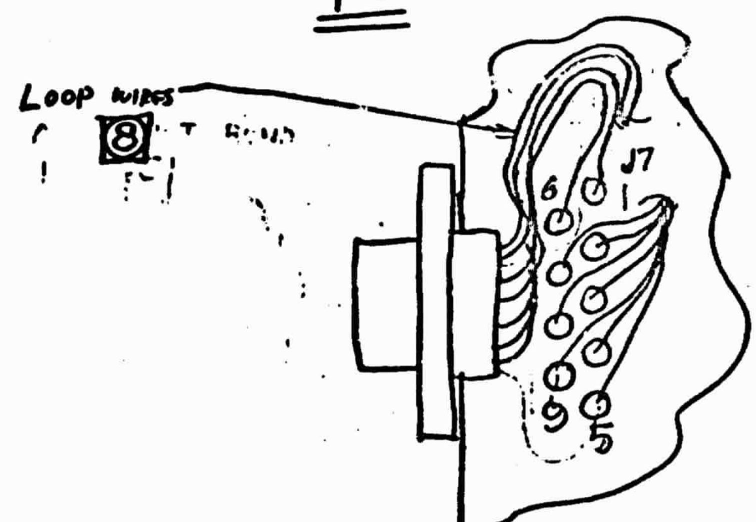
DESCRIBE CHANGE AND GIVE REASON: INCREASE LENGTH OF WIRES AND ADD SERVICE LOOP, TOO SHORT OF WIRES CAUSES STRESS AND BREAKAGE

ZONE 5F, ADD SERVICE LOOP ~~TO~~ J7 WIRES

CHANGE FROM



TO



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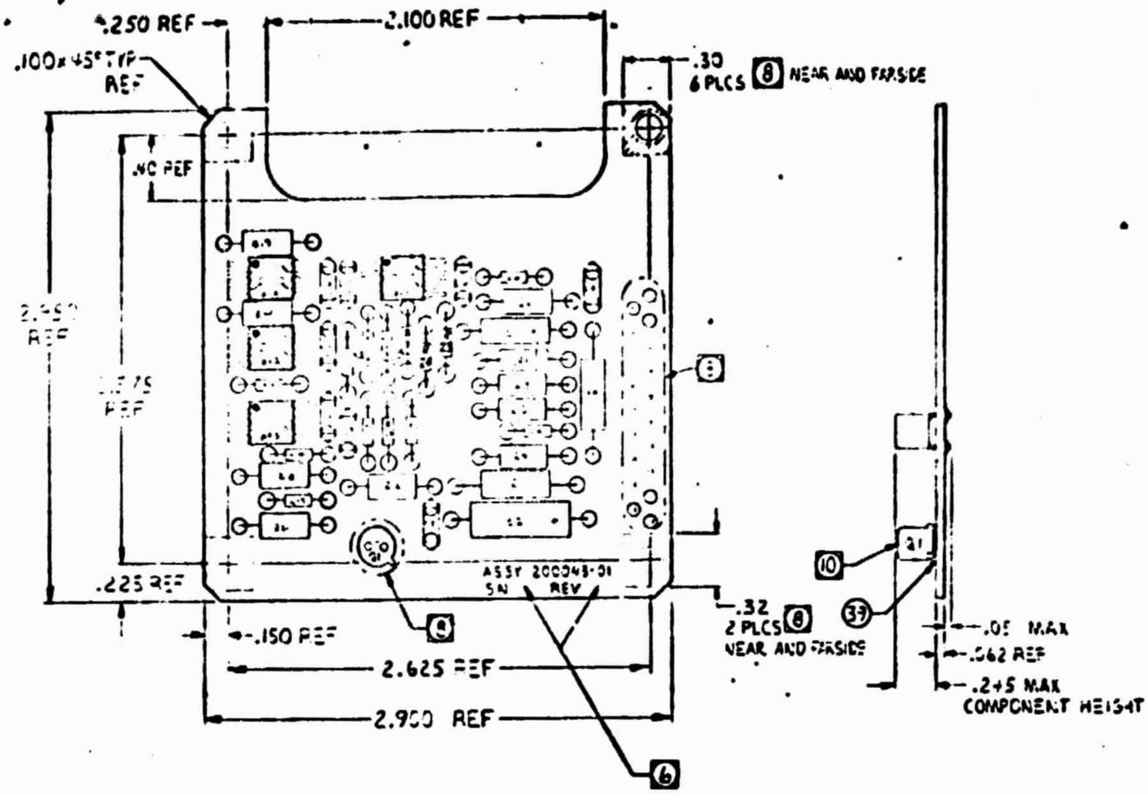
4 3

D



C

B

NOTES: UNLESS OTHERWISE SPECIFIED

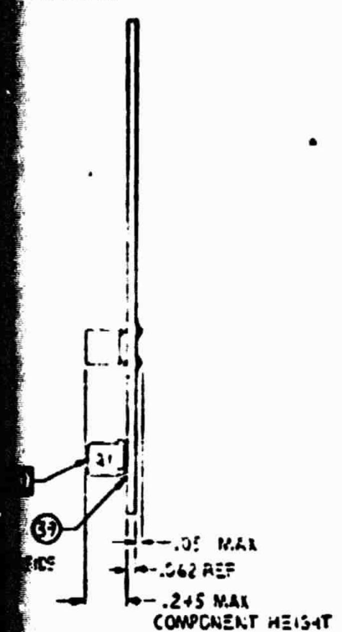
1. FOR SCHEMATIC SEE SCH 200050.
2. FOR TEST SPEC SEE S200043.
3. CORRELATE REF DESIGNATION TO COMPONENTS BY SEPARATE PARTS LIST PL 200043.
4. PARTIAL REF DESIGNATION ARE SHOWN. FOR COMPLETE DESIGNATION PREFIX WITH UNIT ASSEMBLY DESIGNATION.
5. SOLDER PER NHB 5300.4 3A-1, USING ITEM 46.
6. MARK SERIAL NUMBER AND REVISION LETTER PER S40111. CLASS III, TYPE III USING ITEMS 42 AND 43.
7. CONFORMAL COAT PER S-3028, CLASS II, TYPE I, CURE A OR B.
8. THESE AREAS TO BE FREE OF CONFORMAL COATING.
9. BOND APERTURE ... TO BOARD USING ITEM 47.
10. APPLY ... RINGS OF ... TO INSURE CONTACT BETWEEN ...

A

4 3

2 1

REVISIONS			
2	A	UPDATE FOR FLIGHT. NEW EC NOMENCLATURE HAS BEEN CHANGED ON X200044.	



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FOR PARTS LIST SEE PL 200043

QTY REQD PER NOTE, ASSY	
CONFIGURATION	
L 200043	
TICAL	
200100	200100
APPLICATION	

PRINTED WIRING BOARD
ASSEMBLY, HEATER BD.

SIZE	CODE IDENT NO	DWG NO	REV
D	13126	...043	A

2 1

Aerospace Systems Division Western Laboratories

WL-4-5-A (1-78)

ENGINEERING ORDER

DIST CODE 010A RELEASED APR 20 '81

Title	JOB NO.	CODE IDENT NO.	
P.W. BD ASSY - HEATER VHM	2920	13126	EO — 200043 A-1

TYPE OF EO	DISPOSITION OF PARTS			NEXT ASSY 200056-01	EFFECTIVITY SN1 & UP
CHANGE	☒ USE	CHECK	4-20-81	MODEL NO.	
VARIANCE	☒ REWORK	ENGR	4-20-81		
SUPERSEDING	☐ SCRAP	PM	4-20-81	OTHER DWG AFFECTED SCH200050 PC200044	ECP
VOIDED	☐ NOTED BELOW	APPR	4-20-81		
		CUSTOMER	4-20-81		SHT 1 OF 1

DESCRIBE CHANGE AND GIVE REASON: ENGR CHANGE

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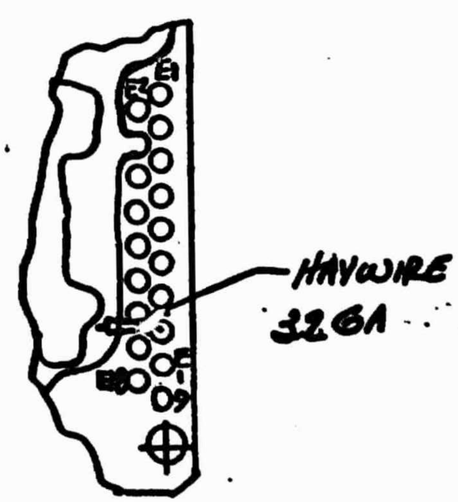
1. INSTALL HAYWIRE FROM E15 TO E4 (GND)

REWORK PROCEDURES

A. SOLDER HAYWIRE AT E15

B. LAP SOLDER HAYWIRE TO GND PLANE AS SHOWN BELOW



QTY OF	R NOTED ASSY	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	CODE	ZONE	ITEM NO.

QTY N°	R NOTED ASSY	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	CODE	ZONE	ITEM NO.

Aerospace Systems Division — Western Laboratories

ENGINEERING ORDER

W L-4-5-A (1-78)

DIST CODE 010A RELEASED SEP 02 1991

DRAWING TITLE	JOB NO.	CODE IDENT NO.	
PW BOARD ASSY, HEATER BD VHM	2920	13126	EO — 200043 A-2

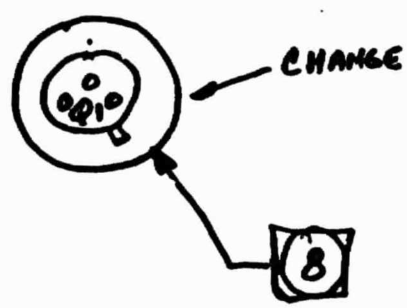
TYPE OF EO	DISPOSITION OF PARTS			
☒ CHANGE	☐ USE	ORIG WPBJ DATE 8-31-81	NEXT ASSY 200056	EFFECTIVITY SN 1 & UP
☐ VARIANCE	☒ REWORK	CHECK	MODEL NO.	
☐ SUPERSEDING	☐ SCRAP	ENGR [signature] 8-31-81		
☐ NOTED	☐ NOTED BELOW	PJ [signature] 9-1-81	OTHER DWG AFFECTED	ECP
		APPR [signature]		
		CUSTOMER WPBJ 9-2-81		SHT 1 OF 1

DESCRIBE CHANGE AND GIVE REASON: CLARIFY COATING AREA

1. ADD TO NOTE 8

TOP SURFACE OF Q1 & HEAT SINK SHALL BE FREE OF CONFORMAL COATING

2. IN ZONE 4C CHANGE PHANTOM LINE TO SOLID LINE



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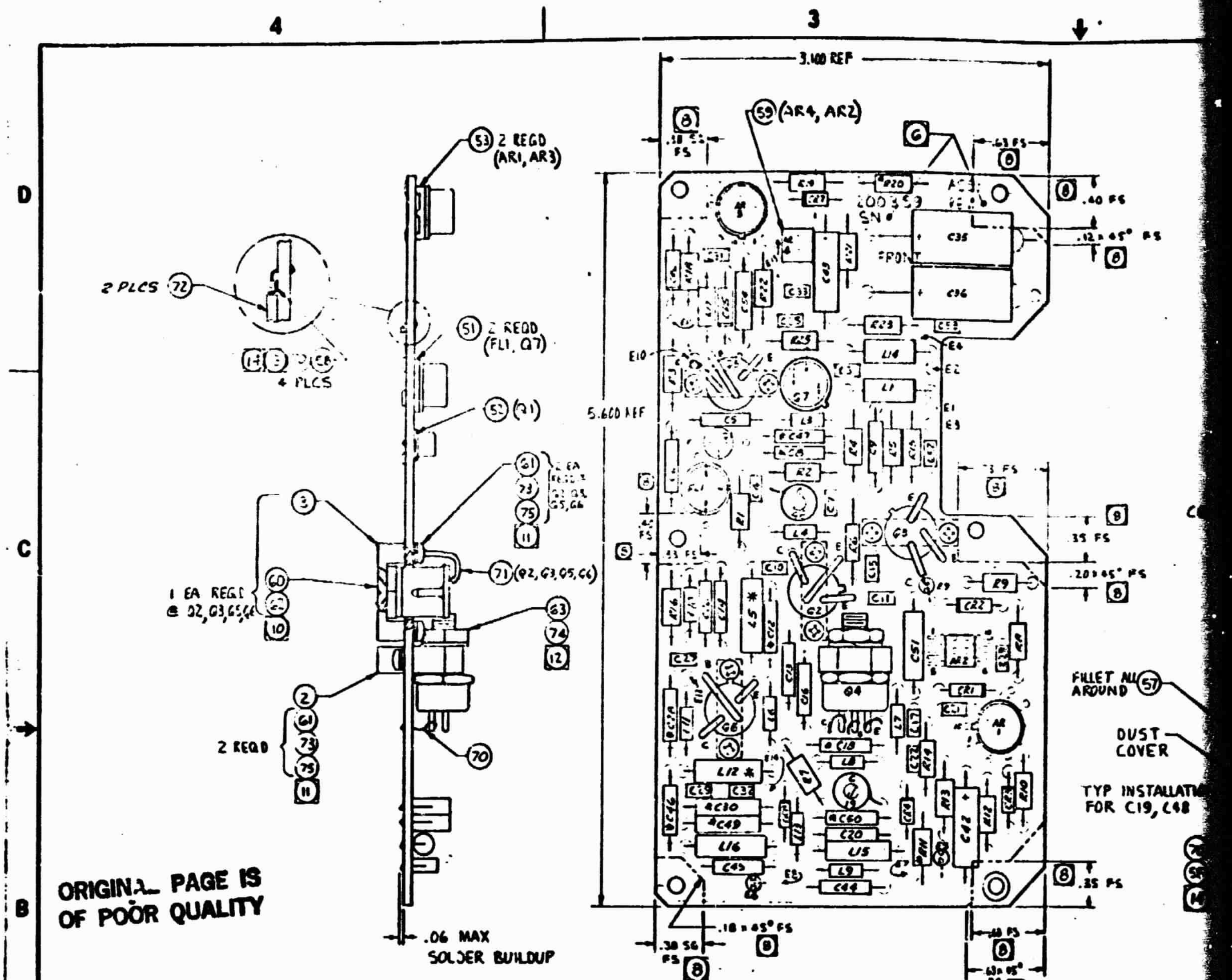
QTY REQ	NOTED ASSY	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	CODE IDENT	ZONE	ITEM NO.

FOLDOUT FRAME



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NOTES: UNLESS OTHERWISE SPECIFIED

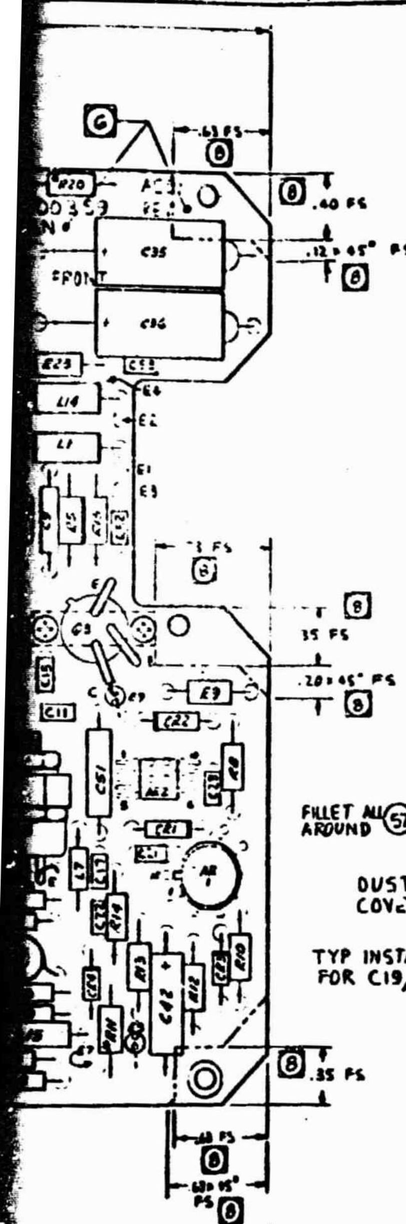
1. FOR SCHEMATIC SEE SCH200053
2. FOR TEST SPEC SEE S 200053
3. CORRELATE REF DESIGNATION TO COMPONENTS BY SEPARATE PARTS LIST PL200359.
4. PARTIAL REF DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATION PREFIX WITH UNIT ASSY DESIGNATION.
5. SOLDER PER NHB5300.4(3A-1) USING ITEM 58.
6. MARK SERIAL NO & REV LETTER PER S40111 CLASS III, TYPE I, WHERE SHOWN, USING ITEMS 54 & 55.
7. CONFORMAL COAT PER S43028 CLASS II, TYPE I, USING ITEM 56.
8. DO NOT COAT DIMENSIONED AREAS (FAR SIDE), .250 DIA (NEARSIDE) AT BD MTG HOLES, E1 – E10, AREAS AROUND "SELECT AT TEST" COMPONENTS (IDENTIFIED WITH *), AND BOTTOM SURFACE OF HEATSINKS.
9. SLEEVE LEADS OF Q2, Q3, Q5, Q6, AND BASE LEAD OF Q4.
10. TORQUE TO 5.00 ± .25 INCH-LBS
11. TORQUE TO [illegible] ± .25 INCH-LBS
12. TORQUE TO 16.0 ± .5 INCH-LBS
13. TERMINATE [illegible] SHIELD (WITH WIRES) TO GROUND PLANE AT POINT CLOSEST TO [illegible] CONDUCTOR [illegible] CONNECTION.
14. WRAP ITEM [illegible] FULL TURN MIN AROUND C19, C48 & ITEM 72 SHIELD

3

2 FOLDOUT FRAME

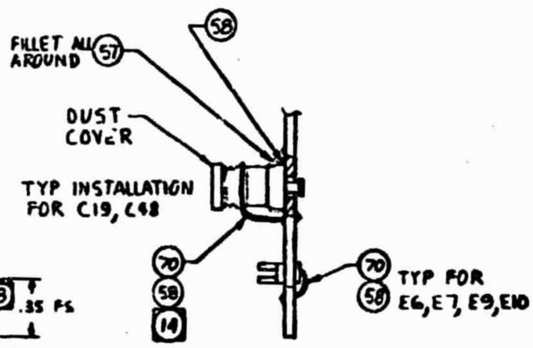
DWG NO. 200359

REVISIONS



WIRE LIST		
FROM	TO	ITEM NO.
E11	E12	72
E13	E14	72

CENTER CONDUCTOR



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PART NO.	SPECIFICATION	NOMENCLATURE OR DESCRIPTION	ELEC REF DES	CODE IDENT	ZONE	ITEM NO.

LIST OF MATERIALS

QTY REQD PER NOTED ASSY

CONFIGURATION

-01 | NEXT ASSEMBLY | FINAL ASSEMBLY

APPLICATION

INTERPRET THIS DRAWING PER STANDARDS IN MIL-D-1000

DIMENSIONS ARE IN INCHES

TOLERANCES ON DECIMALS .X ± .1 .XX ± .03 .XXX ± .010 ANGLES ± 0° 30'

Ball Brothers Research Corporation

TITLE: PRINTED WIRING BD ASSY RF

SIZE D | CODE IDENT NO 13126 | DWG NO. 200359

SHIELD

Aerospace Systems Division Western Laboratories

W L-4-5-A (1-78)

ENGINEERING ORDER

DIST CODE 010A RELEASED DEC 0 9 1981

DRAWING	JOB NO.	CODE IDENT NO.	
PRINTED WIRING BD ASSY RF	2920	13126	EO — 200359NC-1

TYPE OF EO	DISPOSITION OF PARTS			
☐ CHANGE	☐ USE	ORIG GAUGHEN DATE 12/7/81	NEXT ASSY 200057-02	EFFECTIVITY SN 1 & UP
☐ VARIANCE	☒ REWORK	CHECK WPDS 12-7-81	MODEL NO.	
☐ SUPERSEDING	☐ SCRAP	[illegible] 12-9-81		
☐ NOTED	☐ NOTED BELOW	[illegible] 12-9-81	OTHER DWG AFFECTED PL 200359	ECP
		APPR [illegible] 12/9/81		
		CUSTOMER WPDS 12-7-81		SHT 1 OF 1

DESCRIBE CHANGE AND GIVE REASON: CAPACITORS C35, C36 MOVE INSIDE OF THEIR SLEEVING CAUSING EXCESSIVE STRESS ON THEIR LEADS.

REWORK INFO:

A. REMOVE SLEEVING FROM CAPACITORS C35 AND C36.

B. SAVE YELLOW DOT & SERIAL NO. & BOND TO CAP BODY

* C. TRIM LEADS AS SHOWN BELOW (.125 TO .150) TYP

D. BOND CAPS PER NOTE 15

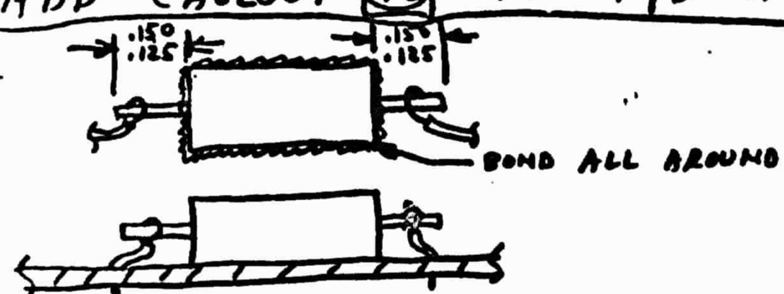
E. ETCH INSULATION OF ITEM 64 [illegible]

F. WRAP WIRE (ITEM 64) AROUND CAP LEADS 270° TO 360°

ADD NOTE 15 "BOND C35 AND C36 ALL AROUND TO BOARD PER $43024, TYPE V, USING ITEM 57."

ZONE 3D, ADD CALLOUT 15 TO F/D AT C35/C36

*



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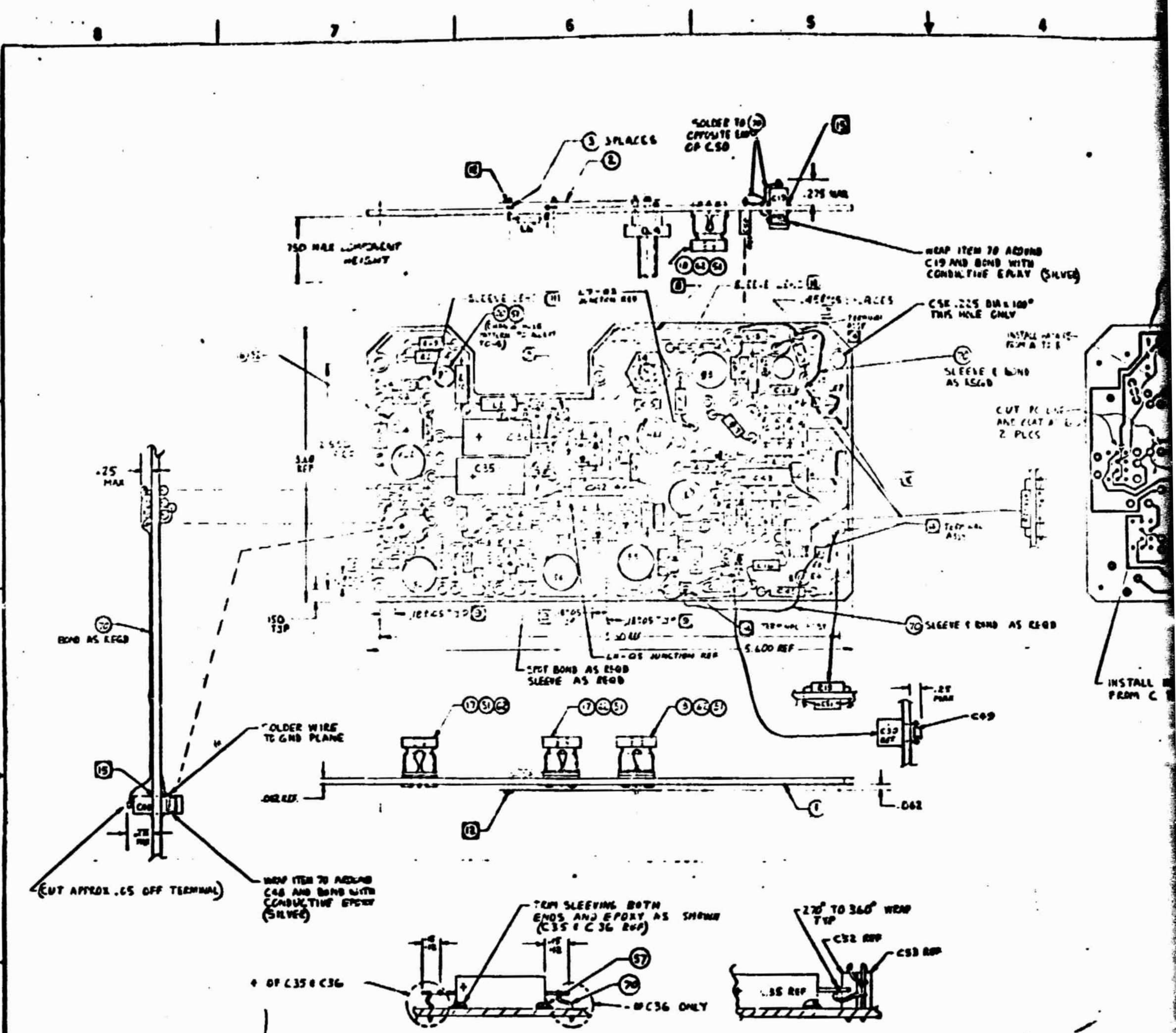
QTY REQ	NOTED ASSY	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	CODE IDENT	ZONE	ITEM NO.



FOLDOUT FRAME

WIRE LIST		
FROM	TO	WIRE
E1	C1	70
E2	C2	70
E3	C29	70
E4	C39	70
E6 & E8	J5	(5) (72)
E5 E7	P6	(3) 72

(15) BOND (FILLET) BOTH SIDES OF BOARD PER S43026, TYPE II, USING ITEM 57 (TYPICAL C19 & C48).

(14) BOND TERMINAL ASSY PN ST1425?-5 (-6) TO BOARD AFTER WHERE SHOWN PER S43026 TYPE II USING ITEM 57. FILLET ALL AROUND.

13. DELETED

(12) SOLDER THE BASE OF Q4 & ONE LEAD OF L6 WITH THE CONDUCTOR PLATE ITEM-2

(11) SLEEVE THE PIN-7 OF AR-1 & EMITTER LEAD OF Q7.

(10) INSTALL ITEM 59 UNDER ALL INTEGRATED CIRCUITS.

(9) DO NOT CONFORMAL COAT THIS AREA NEARSIDE & FARSIDE

(8) MARK THE FOLLOWING PER S4??? CLASS III TYPE I USING ITEM 54 & 55 APPROXIMATELY WHERE SHOWN
ASSY ?COO??-01 REV....
SN ...

7. SCREEN PARTS AS REQD PER S? .07?.
6. CONFORMAL COAT PER S45?? CLASS II TYPE I CURE A OR B
5. SOLDER PER ????? USING ITEM 58
4. PARTIAL ?? DESIGNATIONS ARE SHOWN FOR COMPLETE ??? WITH ??? DESIGNATION
3. ??? ??? TO COMPONENTS BY ??? ??? PL ???
2. ??? S7 ???
1. [illegible]
NOTES: UNLESS OTHERWISE SPECIFIED

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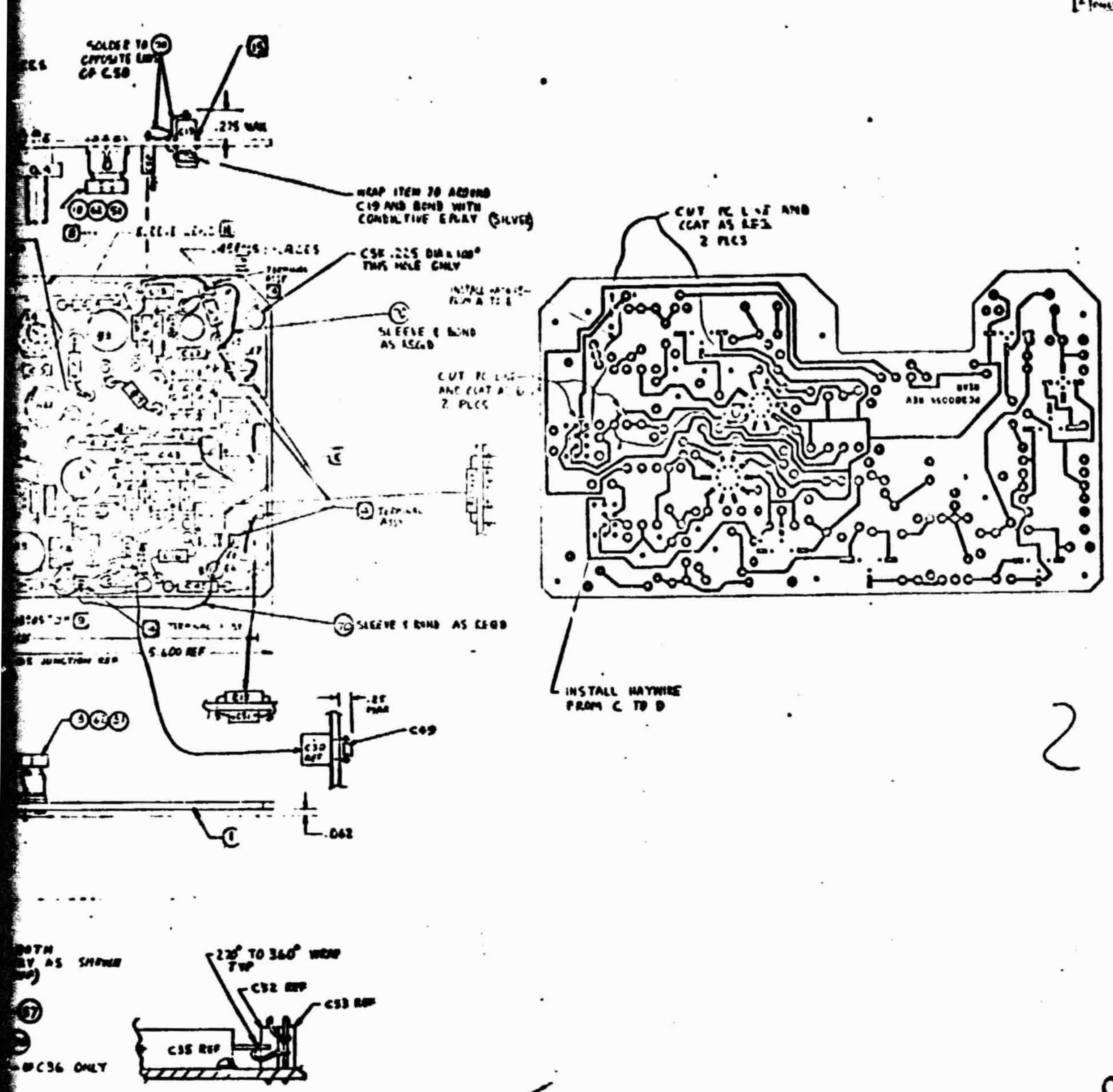

2 FOLDOUT FRAME

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BOND (FILLET) BOTH SIDES OF BOARD PER S43026, TYPE X, USING ITEM 57 (TYPICAL C1-C48).

BOND TERMINAL ASSY PN ST1125-5 (& -6) TO BOARD WHERE SHOWN PER S43026 TYPE X USING ITEM 57. FILLET ALL AROUND.

DELETED

SOLDER THE BASE OF Q4 & ONE LEAD OF L6 WITH THE CONDUCTOR PLATE ITEM-2

SLEEVE THE PIN-7 OF AR-1 & EMITTER LEAD OF Q7.

INSTALL ITEM 39 UNDER ALL INTEGRATED CIRCUITS.

DO NOT CONFORMAL COAT THIS AREA NEARSIDE & FARSIDE

MARK THE FOLLOWING PER S4... CLASS III TYPE I USING ITEM 54 & 55 APPROXIMATELY WHERE SHOWN ...2C00053-...

FOR PARTS LIST SEE PL 2C...053

PRINTED WIRING BOARD

SECTION 8

Parts Lists

- Top Assembly (PL 200056)
- Analog (PL 200059)
- Digital (PL 200061)
- Low Voltage Power Supply (PL 200050)
- Heater (PL 200043)
- RF Proto Configuration (PL 200053)
- RF Flight Configuration (PL 200359)

Ball Brothers Research Corporation — Western Aerospace Laboratories

DIST CODE	PARTS LIST NO.	REV
010A	PL 200056	

REVISIONS

EFF	REV	DESCRIPTION	BY	CK	DATE	APPD

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NOTES: UNLESS OTHERWISE SPECIFIED

APPLICATION			
	CONTRACT NO.		
NEXT ASSY	DRAWN G. Gaughen	26 MAR 1981	
200036	CHECK		
	MECH ENGR		
	ELECT ENGR		
FINAL ASSY	PROJ MGR D. A.	4/13/81	
200036	APPD	4/13/81	
	DESIGN ACTIVITY APPD W(B)	4-16-81	
	CUSTOMER		

TITLE

PARTS LIST
ELECTRONICS ASSY
VHM

SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
A	13126	PL 200056	

SCALE --- RELEASED [illegible] SHEET 1 OF 3

ORIGINAL PAGE IS
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QTY REQD			PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
		-01						
		1	200058-11		HOUSING			1
		1	200039-11		COVER, TOP			2
		1	200348-11		COVER, REAR			3
		1	200061-01		PWB ASSY, DIGITAL			4
		1	200059-01		PWB ASSY, ANALOG			5
		1	200043-01		PWB ASSY, HEATER			6
		1	200050-01		PWB ASSY, LVPS			7
		1	200046-11		PLATE, MTG, EMI FLT.			8
		1	200353-11		GASKET			9
								10
								11
		4	200355-11		STANDOFF, HTR			12
		9	200355-12		STANDOFF, ANA/DIG			13
		1	200355-13		STANDOFF, ANA/COV			14
								15
								16
		1	DEM-9P-NMC-K56	CANNON	CONNECTOR	J01		17
		4	D20418-52	CANNON	SCREW LOCK ASSY, FEMALE			18
		3	320-9505-004	CANNON	JACKPOST KIT			19
								20
		28	MS35338-135		WASHER, LOCK, CRES #4			21
		28	NAS620C4L		WASHER, FLAT, CRES, #4			22
		28	MS51957-13		SCREW, PAN HD, CRES	4-40 x	$\frac{1}{4}$ LG	23
		2	MS35649-244		NUT, HEX, CRES, 4-40			24
		15	MS24693-C1		SCREW FH 100° CRES	4-40 x	$\frac{3}{16}$ LG	25

TITLE:	SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
PARTS LIST ELECTRONICS ASSY VHM	A	13126	PL 200056	

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QTY REQD			PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
		-01						
		2	NAS662C2R4		SCREW, F H 100°, CRES	2-56 x	1/4 LG	26
		6	NAS620C2L		WASHER, FLAT, CRES #2			27
		12	MS35338-134		WASHER, LOCK, CRES, #2			28
		2	MS35649-224		NUT, HEX, CRES, 2-56			29
		4	MS51957-3		SCREW, PAN HD, CRES	2-56 x	1/4 LG	30
								31
								32
								33
		AR	SN63WRAP2	QQ-S-571	SOLDER			34
		AR	0151	HYSOL	EPOXY PATCH			35
		AR	26AWG TYPE E	MIL-W-16878	WIRE, INS, TEFLON, WHT (ETCHED-19 STRANDS)			36
		AR	AMS3654		SHRINK TUBING			37
		AR	20D96	GUDEBROD	TAPE, LACING, WHT			38
								39
								40
								41
								42
								43
		REF	S43028		SPEC, CONF COATING			44
		REF	S43024		SPEC, BONDING			45
		REF	NHB5300.4(3A-1)		SPEC, SOLDERING			46
								47
								48
								49
								50

TITLE:	SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
PARTS LIST ELECTRONICS ASSY VHM	A	13126	PL 200056	

RELEASED SHEET 2

Aerospace Systems Division   Western Laboratories

W L-4-5-A (1-78)

ENGINEERING ORDER

DIST CODE 010 A   RELEASED JUL 29 1981

DRAWING TITLE	JOB NO.	CODE IDENT NO.	
PARTS LIST ELECTRONICS ASSY, VHM	2920	13126	EO — PL 200056NC-1

TYPE OF EO	DISPOSITION OF PARTS				EFFECTIVITY
[X] CHANGE	[ ] USE	ORIG GAUGHEN	DATE 7-27-81	NEXT ASSY 200036	SN 1 & UP
[ ] VARIANCE	[X] REWORK	CHECK WPBJ	7-28-81	MODEL NO.	
[ ] SUPERSEDING	[ ] SCRAP	ENGR	7-28-81		
		PM	7-30-81		
[ ] NOTED	[ ] NOTED BELOW	APPR	7/29/81	OTHER DWG AFFECTED 200056	ECP
		CUSTOMER WPBS	7-29-81		SHT 1 OF 1

DESCRIBE CHANGE AND GIVE REASON: TO ADAPT HOUSING FOR P.C ASSY HOLE MATCH, AND CONNECTOR MATCH TO HOUSING

CHANGE ITEM 21 FROM 28 REQD TO 32 REQD

CHANGE ITEM 22 FROM 28 REQD TO 32 REQD

CHANGE ITEM 12 FROM "STANDOFF, HTR" TO "STANDOFF (HTR, M/FEM)"

CHANGE ITEM 13 FROM 9 REQD, "STANDOFF, ANA/DIG" TO 7 REQD, "STANDOFF, (ANA/DIG, M/FEM)"

CHANGE ITEM 14 FROM "STANDOFF, ANA/COV" TO "STANDOFF, (ANA/COV, M/FEM)"

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CANCELLED PER EO-NC-2

ADD

QTY REQ	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	CODE IDENT	ZONE	ITEM NO.
1	200366-11		ADAPTOR, CONNECTOR				11
2	200355-14		STANDOFF (ANA/DIG, SHORT, FEM/FEM)				15
2	200365-11		ADAPTOR, STANDOFF				16
4	MS51957-14		SCREW, PAN HD, CRES, 4-40 x 5/16 LG				20
-01							

Aerospace Systems Division — Western Laboratories

W L-4-5-A (1-78)

ENGINEERING ORDER

DIST CODE 010A — RELEASED OCT 0 5 1981

DRAWING TITLE	JOB NO.	CODE IDENT NO.	
PARTS LIST ELECTRONICS ASSY, VHM	2920	13126	EO — PL 200056 NC-2

TYPE OF EO	DISPOSITION OF PARTS		NEXT ASSY 200036	EFFECTIVITY
[x] CHANGE	[ ] USE	ORIG GAUGHEN DATE 10/2/81		SN 1 & UP
[ ] VARIANCE	[x] REWORK	CHECK [illegible] 10-5-81	MODEL NO.	
[ ] SUPERSEDING	[ ] SCRAP	ENGR [illegible]		
		PJ D. [illegible] 10-6-81		
		APPR [illegible]	OTHER DWG AFFECTED 200056	ECP
[ ] NOTED	[ ] NOTED BELOW	CUSTOMER [illegible] 10-8-81		SHT 1 OF 1

DESCRIBE CHANGE AND GIVE REASON: NEW HOUSINGS WILL BE MADE OF ALUMINUM AND DRAFTING ERRORS CORRECTED THUS CANCELLING THE NEED FOR THE NC-1 EO.

THIS EO CANCELS EO PL200056 NC-1

IN ITS ENTIRETY

G.G. 10/2/81

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ITEM NO.	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	CODE IDENT	ZONE	ITEM NO.

W L-4-5-A (1-78)

Aerospace Systems Division — Western Laboratories

ENGINEERING ORDER

DIST CODE 010A RELEASED NOV 12 1981

DRAWING TITLE	JOB NO.	CODE IDENT NO.	EO
PARTS LIST, ELECTRONICS ASSY VHM	2920	13126	EO — PL 200056 NC-3

TYPE OF EO	DISPOSITION OF PARTS				
☒ CHANGE	☐ USE	ORIG WPBJ	DATE 11-10-81	NEXT ASSY 200056	EFFECTIVITY SN1 & UP
☐ VARIANCE	☒ REWORK	CHECK		MODEL NO.	
☐ SUPERSEDING	☐ SCRAP	ENGR	11-10-81	OTHER DWG AFFECTED	ECP
☐ NOTED	☐ NOTED BELOW	PE / APPR	11/10/81		SHT 1 OF 1
		CUSTOMER WPBJ	11-10-81		

DESCRIBE CHANGE AND GIVE REASON: SCREW TOO SHORT

1. CHANGE ITEM 26:
   FROM: NAS662C2R4 --- 2-56 X 1/4 LG
   TO: NAS662C2R6 --- 2-56 X 3/8 LG

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		PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	CODE IDENT	ZONE	ITEM NO.

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	DIST CODE	PARTS LIST NO.	REV
Ball Aerospace Systems Division — Western Laboratories	010A	PL 200059	B

REVISIONS

EFF	REV	DESCRIPTION	BY	CK	DATE	APPD
1 & UP	A	1. INCORPORATED E.O. PL200059, NC-1 CHG. NO. 1, 3 thru 7, 9, 11, 12, 13 & 23 2. INCORPORATED E.O. PL200059 NC-2, ITEMS 190, 191 3. ADDED SHEET 14 (ALL ITEMS) 4. ADDED NOTE 1, 2 5. REVISED: ITEMS 4, 22, 23, 24, 32, 33, 41, 93, 116, 149, 154, 158, 160 & 182 6. ADDED ITEMS: 35, 208 & 209	[illegible]	[illegible]	1/14/81	[illegible] 1/15/81 [illegible] 1/15 [illegible] 3/9/81 D.A.
-1 & UP	B	INCORPORATED EO'S A1 THRU A4. DO NOT INCORPORATE ITEM #2 ON EO A4: NOTE 2 WAS: TB1 SHALL BE USED ON PROTOTYPE (SN1) ONLY, TB1 INCLUDES AR19, R161, R162, R163, CR25, CR26, C83. ADDED NOTE 3, ITEM 227 & -020 ON PL. DELETED AR19 FROM ITEM #1. QTY REQD WAS: 19. DELETED C83 FROM ITEM #6, QTY REQD WAS: 19. DELETED CR25 & CR26 FROM ITEM #10, QTY REQD WAS: 11. DELETED R162 FROM ITEM #93, QTY REQD WAS: 3. DELETED R163 FROM ITEM #95, QTY REQD WAS: 4. DELETED ITEM #116. QTY REQD: 1; PART NUMBER: RNC55H4992FS; SPEC: ST11548; DESCRIPTION: RESISTOR, 49.9K [illegible]	[illegible]	WPBJ	27 APR 1981	[illegible] 5-8-81 T.R. [illegible] WPBJ D.A.

(3) ITEM 227 & 228 SHALL BE USED FOR FLT (SN2 & UP)

(2) ITEM 226 SHALL BE USED ON PROTOTYPE (SN1 ONLY)

(1) PRE-SELECT; MEASURE & RECORD EACH COMPONENT NOTED WITHIN ±.01% PRIOR TO INSTALLATION.

NOTES: UNLESS OTHERWISE SPECIFIED

APPLICATION			
NEXT ASSY	CONTRACT NO. [illegible]		
200059	DRAWN TORNOW	7/22/	
	CHECK WPBJ	10-20-80	
	MECH ENGR		
	ELECT ENGR [illegible]	10-21-80	
FINAL ASSY	PROJ MGR D Snyder	10-21-80	
200C036	APPD [illegible]	10-21-80	
	DESIGN ACTIVITY APPD WPBJ	10-20-80	
	CUSTOMER		

TITLE PARTS LIST
PRINTED WIRING BOARD ASSEMBLY
SERVO ELECTRONICS
VHM (ANALOG)

SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
A	13126	PL 200059	B

SCALE — RELEASED [illegible] SHEET 1 OF 14

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QTY REQD 01	PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
18	LM108AFBR	ST11499	OPER AMP.	AR1, AR2, AR3, AR4, AR5, AR6, AR7, AR8, AR9, AR10, AR11, AR12, AR13, AR14, AR15, AR16, AR17, AR18		1
1	200060-11		PRINTED WIRING BD			2
1	200246-11		SHIELD			3
2	200247-11		COVER			4
1	200256-11		BRACKET, MTG	(FOR Q4)		5
2	M39014/01-1587	ST11560	CAPACITOR .047PF, ±10% 50V	C50, C56		6
3	-1330	ST11560	33PF, ± 10% 200V	C11, 26, 41		7
18	-1339	ST11560	100PF, ± 10% 200V	C2, 6, 13, 17, 21, 28, 32, 36, 43, 47, 57, 58, 53, 61, 65, 70, 77, 79		8
1	-1351	ST11560	470 PF, ± 10% 200V	C49		9
3	-1584	ST11560	.033UF, ± 10% 50V	C5, 20, 35		10
15	-1575	ST11560	.01UF, ± 10% 100V	C1, 3, 14, 15, 16, 18, 29, 30, 31, 33, 44, 45, 66, 75, 76		11
1	M39014/01-XXXX	ST11560	CAPACITOR, SAT ±10%	C84		12
1	M39014/01-1587/1589	ST11560	.047UF/.056UF/50V			
1	M39014/01-1590/1592	ST11560	.068UF/100V .082UF/50V			
1	M39014/02-1350/1353	ST11561	.1 UF/50V .12UF/50V			
1	M39014/02-1354	ST11561	CAPACITOR .15UF/50V			

TITLE: PRINTED WIRING BD ASSY SERVO ELECT. ANALOG VHM

SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
A	13126	PL 200059	B

SCALE — RELEASED SHEET 2 OF

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QTY REQD 01	PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
2	M39014/02-XXXX	ST11561	CAPACITOR, SAT, ±10%	C85, 86		13
	-1360	ST11561	.47UF/50V			
	-1416		.56UF			
	-1417	ST11561	.68UF/50V			
	-1418		.82UF			
	M39014/02-1419	ST11561	1 UF/50V			
6	M39014/C. 1593	ST 11560	.1UF, ± 10% 50V	C60, 62, 63, 64, 67, 89		14
7	M39014/02-1419	ST 11561	1UF ± 10% 50V	C4, 19, 34, 55, 68, 69, 87		15
1	M39014/02-1417	ST11561	.68UF ±10% 50V	C78		16
4	M39003/01-3009	ST11700	15UF, ±10% 20V	C51, 52, 53, 54		17
1	M39003/01-2979	ST11700	39UF, ±10% 10V	C46		18
1	M39003/01-2985	ST11700	220UF, ±10% 16V	C81		19
						20
						21
3	M83421/01-1093	MIL-C-83421	.012UF ±1% 30V	C10, 25, 40	I	22
3	M83421/01-1159	MIL-C-83421	.068UF ±1% 30V	C9, 24, 39	I	23
3	M83421/01-1141	MIL-C-83421	.047UF ±1% 30V	C7, 22, 37	I	24
1	M83421/01-1371	MIL-C-83421	22UF ± 5% 30V	C48		25
						26
						27
1	CYFR10S5R1C	CORNING	CAPACITOR 5.1 PF ±0.25% 500V	C80		28
						29
						30
						31

TITLE: PRINTED WIRING BD ASSY. SERVO ELECT. ANALOG VHM	SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
	A	13126	PL 200059	B
	SCALE —	RELEASED	SHEET 3 OF	

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QTY REQD		01	PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
		3	CCR05CG331FR	MIL-C-20/35	CAPACITOR SELECT ±1% 0 pf or 330PF	C12,27,42		32
		3	CCR05CGXXXFR	MIL-C-20/35	SELECT ±1% 330PF, 680PF, 1000PF, 1200 PF, 1500 PF, 1800PF	C8,23,38		33
		4	CCR06CG392FR	MIL-C-20/36	3900PF ±1% 100V	C71, 72, 73, 74		34
		3	CCR05CGXXXFR		SELECT ±1% 330PF, 680 PF, 1000 PF, 1200PF, 1500 PF, 1800PF, 2200PF	C90,91,92		35
								36
		2	135D946X9050T2	MIL-C-39006	CAPACITOR 94UF, ±10% 50V	C82, 83		37
								38
								39
		14	JANTXV1N4150	MIL-S-19500/231	DIODE, SWITCHING	CR1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 18, 19		40
		8	JANTXV1N4148	PT40015	DIODE, SWITCHING	CR13, 14, 15, 17, 20, 21,	23, 24	41
		1	FD643	ST11330	DIODE, SIGNAL	CR22		43
		3	JANTXV2N2222A	ST 11790	TRANSISTOR, NPN	Q3,5,6		44
								45
		1	2N2880	ST 11805	NPN	Q4		46
								47
		1	2N2907A	ST 11795	PNP	Q2		48
								49
		1	2N3251A	ST 11797	PNP	Q7		50
								51
		1	2N3501	ST 11801	NPN	Q8		52
								53
		1	JANTX 2N4856	ST 11816	TRANSISTOR FET	Q1		54

TITLE	SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
PRINTED WIRING BD. ASSY SERVO ELECT. ANALOG VHM	A	13126	PL 200059	B
	SCALE	RELEASED	SHEET 4 OF	

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QTY REQD 01	PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
7	RCR05G101JS	ST11751	RESISTOR, 100Ω ±5%, 1/8W	~~R44,45,46~~ ~~47,55,~~ ~~94, 95~~		55
						56
1	102JS	ST11751	1K	R97		57
2	512JS	ST11751	5.1K	R96,105		58
						59
4	103JS	ST11751	10K	R48,56, 62, 108		60
1	123JS	ST11751	12K	R92		61
						62
2	203JS	ST11751	20K	R59,102		63
1	223JS	ST11751	22K	R106		64
						65
4	513JS	ST11751	51K	R109,111, 158,145		66
1	563JS	ST11751	56K	R91		67
						68
4	683JS	ST11751	68K	R110,112, 144,159		69
						70
7	104JS	ST11751	100K	R54,57,58, 86, 100, 101, 103		71
						72
2	204JS	ST11751	200K	R51,160		73
						74
1	105JS	ST11751	1M	R77		75
2	RCR05G106JS	ST11751	RESISTOR, 10M, ±5%, 1/8W	R76,107		76

TITLE: PRINTED WIRING BD ASSY. SERVO ELECT. ANALOG VHM	SIZE A	CODE IDENT NO. 13126	PARTS LIST NO. PL 200059	REV B
	SCALE —	RELEASED	SHEET 5	OF

ORIGINAL PAGE IS
OF POOR QUALITY

QTY REQD		01	PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
					DELETED			77
								78
		1	RCR20G100JS	MIL-R-39008/2	RESISTOR 10Ω, ±5%, 1/2W	R93		79
								80
								81
								82
								83
		3	RNC55HXXXXFS	ST11548	SAT, ±1%, 1/10W	R6,20,34		84
					10Ω			?
					20Ω			
					30.1Ω			
					40.2Ω			
					49.9Ω			
					60.4Ω			
					69.8Ω			
					80.6Ω			
								85
		1	1000FS	ST11548	100Ω	R71		86
		1	1781FS	ST11548	1.78K	R90		87
								88
								89
		1	1271FS	ST11548	1.27K	R64		90
		1	RNC55H4990FS	ST11548	499Ω,	R75		91
		1	RNC55H1401FS	ST11548	RESISTOR, 4K, ±1%, 1/10W	R52		92
		2	RNC55H2003FS	ST11548	" 200K ±1% 1/10W	R79,164,		93
								94

TITLE	SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
FRINTED WIRING BD ASSY. SERVO ELECT. ANALOG VHM	A	13126	PL 200059	B
SCALE —		RELEASED	SHEET 6 OF	

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QTY REQD 01	PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
3	RNC55H2001FS	ST11548	RESISTOR, 2K ± 1% 1/10W	R9,23,37		95
						96
1	4991FS	ST11548	4.99K	R78		97
1	7151FS	ST11548.	7.15K	R73		98
						99
3	8451FS	ST11548	8.45K	R4,18,32		100
						101
4	1002FS	ST11548	10K	R63,65,72,	60	102
						103
1	XXXXFS	ST11548	SAT 15.8K 16.2K 16.5K 16.9K 17.4K	R88		104
1	2002FS	ST11548	20K	R43		105
1	2672FS	ST11548	26.7K	R99		106
						107
6	3832FS	ST11548	38.3K	R2,8,16, 22,30,36		108
						109
3	4992FS	ST11548	49.9K	R7,21,35		111
						112
3	5902FS	ST11548	59K	R69,70,74		113
						114
3	RNC55H7682FS	ST11548	RESISTOR, 76.8K ± 1% 1/10W	R3,17,31		115
						116

TITLE: PRINTED WIRING BD. ASSY. SERVO ELECT. ANALOG VHM	SIZE A	CODE IDENT NO. 13126	PARTS LIST NO. PL 200059	REV B
SCALE —	RELEASED	SHEET 7 OF		

QTY REQD		01	PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
		3	RNC55H7872FS	ST11548	RESISTOR, 78.7K, ±1%, 1/10W	R1,15,29		117
								118
		1	9092FS	ST11548	90.9K	R66		119
								120
		3	XXXXFS	ST11548	SAT	R5,19,33		121
					64.9K			
					69.8K			
					75K			
					80.6K			
					84.5K			
					90.9K			
					95.3K			
					100K			
					105K			
					113K			
								122
		1	XXXXFS	ST11548	SAT	R61		123
					4.87K, 5.11K			
					5.36K, 5.62K			
					5.9K, 6.19K			
					6.49K, 6.81K			
					7.15K			
								124
		1	1003FS	ST11548	100K	R49		125
		2	1503FS	ST11548	150K	R68,98		126
								127
		5	2003FS	ST11548	200K	R50,53,63, 87,125		128
								129
		1	RNC55H2673FS	ST11548	RESISTOR, 267K, ±1%, 1/10W	R89		130
								131

TITLE: PRINTED WIRING BD. ASSY. SERVO ELECT. ANALOG VHM	SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
	A	13126	PL 200059	B
	SCALE —	RELEASED	SHEET 3 OF	

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QTY REQD 01	PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
1	RNC55J1130DS	ST11548	RESISTOR, 113Ω, ±0.5%, 1/10W	R84		132
1	RNC55J6420DS	ST11548	RESISTOR, 642Ω, ±0.5%, 1/10W	R85		133
3	RNC55H1001BS	ST11548	RESISTOR, 1.0K ±0.1% 1/8W	R14, 28, 42		134
3	RNC55JXXXXFS	ST11548	RESISTOR, SAT, ±1%, 1/10W 357Ω, 383Ω, 715Ω, 768Ω, 1.07K, 1.15K, 1.43K, 1.54K, 1.78K, 1.96K, 2.15K, 2.32K, 2.49K, 2.74K, 2.8K, 3.01K, 3.16K, 3.48K, 3.57K, 3.83K, 3.92K, 4.22K, 4.64K, 4.99K, 5.36K, 5.49K, 5.62K, 5.76K, 6.04K, 6.19K, 6.34K, 6.49K, 6.65K, 6.81K, 6.98K, 7.15K, 7.32K, 7.5K, 7.68K, 7.87K, 8.06K, 8.25K, 8.45K, 8.87K, 9.31K, 9.53K, 10 K, 10.2K, 10.5K, 10.7K, 11K, 11.3K, 11.5K, 11.8K, 12.1K, 12.4K, 12.7K, 13.3K, 13.7K	R128, 133, 137		135
						136
3	RNC55JXXXXFS	ST11548	RESISTOR, SAT, ±1%, 1/10W 44.2Ω, 48.7Ω, 88.7Ω, 95.3Ω, 133Ω, 143Ω, 178Ω, 191Ω, 221Ω, 243Ω, 261Ω, 287Ω, 309Ω, 332Ω, 357Ω, 383Ω, 392Ω, 432Ω, 442Ω, 487Ω, 523Ω, 576Ω, 619Ω, 665Ω, 698Ω, 715Ω, 750Ω, 768Ω, 806Ω, 845Ω, 866Ω, 887Ω, 909Ω, 931Ω, 953Ω, 976Ω, 1.02K, 1.05K, 1.07K, 1.1K, 1.15K, 1.18K, 1.24K, 1.27K, 1.33K, 1.37K, 1.4K, 1.43K, 1.47K, 1.5K, 1.54K, 1.58K, 1.62K, 1.69K, 1.74K, 1.78K	R126, 131, 135		137
						138
						139

TITLE	SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
PRINTED WIRING BD ASSY. SERVO ELECT. ANALOG VHM	A	13126	PL 200059	B

SCALE — RELEASED SHEET 9 OF

ORIGINAL PAGE IS OF POOR QUALITY

QTY REQD 01	PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
3	RNC55JXXXXFS	ST11548	RESISTOR, SAT, ±1%, 1/10W	R150, 153, 156		140
			24.9K, 25.5K, 26.1K, 26.7K, 27.4K			
						141
3	RNC55JXXXXFS	ST11548	RESISTOR, SAT, ±1%, 1/10 W	R118, 121, 124		142
			1.18K, 2.43K, 3.65K, 4.99K, 6.49K, 7.87K, 9.31K, 11K, 12.7K, 14.3K, 24.3K, 26.7K, 29.4K, 32.4K, 35.7K, 38.3K, 41.2K, 44.2K, 48.7K, 52.3K, 56.2K, 61.9K, 66.5K, 71.5K, 76.8K, 84.5K, 90.9K, 100K			
						143
						144
3	RNC55JXXXXFS	ST11548	RESISTOR, SAT, ±1%, 1/10W	R139, 141, 143		145
			63.4K, 64.9K, 66.5K, 68.1K, 69.8K, 71.5K, 73.2K, 75K			
						146
4	RNC55JXXXXFS	ST11548	RESISTOR, SAT, ±1%, 1/10W	R80, 81, 82, 83		147
			75.0K, 76.8K, 78.7K			
						148
9	RNC55J8163BS	ST11548	RESISTOR, 816 K, ±.1%, 1/10W	R10, 11, 12, 24, 25, 26, 38, 39, 40	1	149
			± 25 PPM			
						150
6	RNC55JXXXXFS	ST11548	RESISTOR, SAT, ±1%, 1/10W	R138, 140, 142, 146, 147, 148		151
			511K, 523K, 536K, 549K, 562K, 576K, 590K, 604K			
						152
						153

TITLE	SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
PRINTED WIRING BD ASSY. SERVO ELECT. ANALOG VHM	A	13126	PL 200059	B

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QTY REQD		01	PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
		3	RNC60J2494BS	ST11548	RESISTOR, 2.49M, ±0.1% 1/8W	R13, 27, 41		154
					±50 PPM			155
								156
								157
		1	RBR54L37402BR	ST11770	RESISTOR, 374K, ±0.1% 1/4W	R136		158
								159
		6	RBR54L52302BR	ST11770	RESISTOR, 523K, ±0.1% 1/4W	R116, 119, 122, 149, 152, 155		160
								161
								162
								163
		2	RBR56LXXXXXFR	ST11769	RESISTOR, SAT, ±1% 1/8W	R113, 114		164
					27.4K, 28K, 28.7K 1/8W			
					29.4K, 30.7K 30.9K			
					31.6K, 32.4K, 33.2K 1/8W			
								165
		2	RBR56L41201BR	ST11769	RESISTOR, 41.2K, ±0.1% 1/8W	R127, 130		166
								167
								168
		1	RBR56L45301BR	ST11769	RESISTOR, 45.3K, ±0.1% 1/8W	R134		169
								170
		2	RBR56L59001BR	ST11769	RESISTOR, 59K, ±0.1% 1/8W	R120, 123		171
								172
		1	RBR56L66501BR	ST11769	RESISTOR, 66.5K, ±0.1% 1/8W	R117		173
								174
								175

TITLE	SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
PRINTED WIRING BD ASSY. SERVO ELECT. ANALOG VHM	A	13126	PL 200059	B
	SCALE —	LEASED	SHEET 11 OF	

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QTY REQD		01	PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
		1	RBR56LXXXXXER	ST11769	RESISTOR, SAT, ±1% 1/8 W	R115		176
					73.2K, 75K, 76.8K, 78.7K, 80.6K, 82.5K, 84.5K, 86.6K, 88.7K			
								177
		2	18702BR	ST11769	187K, ±0.1% 1/8 W	R151, 154		178
								179
		1	RBR56L20502BR	ST11769	205K, ±0.1% 1/8 W	R157		180
								181
		2	RBR54L34802BR	ST11769	RESISTOR, 348K, ±0.1% 1/4 W	R129, 132		182
								183
								184
								185
								186
		1	G4049UBR	PT40705-1-B-5	I.C. HEX INVERTER	U2		187
								188
		5	G4053BR	PT40728-3-B-5	I.C. TRIPLE 2-CHAN MULTIPLEXER	U1, 3, 4, 5, 6		189

TITLE: PRINTED WIRING BD. ASSY SERVO ELECT. ANALOG VHM	SIZE A	CODE IDENT NO. 13126	PARTS LIST NO. PL 200059	REV B
	SCALE —	RELEASED	SHEET 12 OF	

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QTY REQD		01	PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
		A/R	50,000 SERIES	WORNOW PROCESS	CATALYST NO. 9			190
		A/R	50,000 SERIES	PAINT CO.	CAT-L-INK, EPOXY			191
		A/R	C113-300	S43028	SOLITHANE			192
		REF	S200059		SPEC, TEST			193
		REF		S40111	SPEC, IDENTIFICATION			194
		REF		S43040	SPEC, FABRICATION			195
		REF		S43024	SPEC, BONDING			196
		REF		MIL-G-55636	SPEC, MATERIAL			197
		REF		S43028	SPEC, CONFORMAL COAT			198
		REF	SCH200059		SCHEMATIC			199
		REF	NHB5300.4(3A-1)		SPEC, SOLDER			200
								201
		1	DBM-25S-NMC-K56	CDF	CONNECTOR, 25S	J4		202
		1	MDM-31SH001B-A141	CANNON	CONNECTOR, 31S	P8		203
		1	MDM-51PH001B-A141	CANNON	CONNECTOR, 51P	P9		204
		1	MS51957-2		SCREW 2-56 X 3/16			205
		1	MS35338-134		WASHER, L #2			206
		1	NAS620C2		WASHER, F #2			207
		1	200246-12		SHIELD			208
		A/R	ABLEFILM 517	ABLESTIK	TAPE, ADHESIVE			209
		A/R	NO. 26 AWG TYPE E	MIL-W-16878/4	WIRE, INSULATED TEFLON, WHITE			210

TITLE: PRINTED WIRING BD. ASSY. SERVO ELECT. ANALOG VHM	SIZE: A	CODE IDENT NO.: 13126	PARTS LIST NO.: PL200059	REV: B
	SCALE: —	RELEASED	13 OF	

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QTY REQD		01	PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
		6	10018-DAP	MILTON ROSS	TRANSIPAD, TO-18			211
		1	10122-DAP	"	TRANSIPAD, TO-5			212
		A/R	SN 63	QQ-S-571	SOLDER			213
		A/R	0151	S43024	EPOXY PATCH, HYSOL			214
		A/R	NO. 26 AWG TYPE S	QQ-W-343	BUSS WIRE			215
		1	MS35338-135		WASHER, LOCKING CRES #4			216
		1	NAS671C4		NUT, HEX S.P. CRES 4-40			217
		1	MS51957-13		SCREW, P.H. CRES 4-40×1/4			218
								219
		1	NAS671C10		NUT, HEX, S.P. CRES 10-32			220
		1	MS35338-138		WASHER, LOCKING CRES #10			221
		A/R	AMS-3654-22	—	TUBING, INSULATION			222
		5	ST11250-5 or ST11250-6	ST-11250	TERMINAL ASSY			223
		A/R	168780	-	HAYWIRE, 32 AWG			224
		REF	S200078	—	SPEC., SCREENING			225
	-	1	200265-01	-	TERMINAL ASSY	TB1	2	226
		1	200357-01		P.W.B. ASSY - PRE AMP BUFFER		3	227
		1	PL200357		PARTS LIST - PRE AMP BUFFER		3	228
								229
								230

TITLE:	SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
PRINTED WIRING BRD. ASSY. SERVO ELECT. ANALOG - VHM	A	13126	PL 200059	B
	SCALE	RELEASED	14	OF 14

Aerospace Systems Division — Western Laboratories

W L-4-5-A (1-78)

ENGINEERING ORDER

DIST CODE 010A RELEASED NOV 12 '81

DRAWING TITLE	JOB NO.	CODE IDENT NO.	EO
PARTS LIST- PRINTED WIRING BD ASSY ANALOG ELECTRONICS UHM	2920	13126	EO — PL 2000059 B-1

TYPE OF EO	DISPOSITION OF PARTS			
[X] CHANGE	[X] USE	ORIG / DATE 12 MAY 81	NEXT ASSY 200059	EFFECTIVITY SN-1 & UP
[ ] VARIANCE	[ ] REWORK	CHECK	MODEL NO. 200036-01	
[ ] SUPERSEDING	[ ] SCRAP	ENGR	OTHER DWG AFFECTED —	ECP
[ ] NOTED	[ ] NOTED BELOW	PIT / APPR / CUSTOMER		SHT 1 OF 1

DESCRIBE CHANGE AND GIVE REASON: DRAFTING ERROR

1. IN DESCRIPTION BLOCK FOR THE "B" REVISION

WAS: ADDED NOTE 3, ITEM 227 & -02 ON PC

IS: ADDED NOTE 3 & ITEM 227 & ITEM # 228.

WAS: DELETED C88 FROM ITEM #6 — — —

IS: DELETED C88 FROM ITEM #8 — — —

WAS: DELETED CR25 & CR26 FROM ITEM #10 — — —

IS: DELETED CR25 & CR26 FROM ITEM #41 — — —

WAS: ITEM 228 - QTY REQD: 1

IS: ITEM 228 - QTY REQD: REF

QTY ✓	NOTED ASSY	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	CODE	ZONE	ITEM NO

Aerospace Systems Division Western Laboratories

ENGINEERING ORDER

W L-4-5-A (1-7..)

UNIT CODE 010A RELEASED MAY 20 '81

DRAWING TITLE	JOB NO.	CODE IDENT NO.	
PARTS LIST PRINTED WIRING BRD VHM	2920	13126	EO PL 200059-REV.B-2

TYPE OF EO	DISPOSITION OF PARTS		NEXT ASSY 200056	EFFECTIVITY 1st UP
[X] CHANGE	[ ] USE	ORIG Jaramillo DATE 5-20-81	MODEL NO. 200036-01	
[ ] VARIANCE	[X] REWORK	CHECK 20 MAY 81		
[ ] SUPERSEDING	[ ] SCRAP	ENGR	OTHER DWG AFFECTED SCH 200059	ECP
[ ] NOTED	[ ] NOTED BELOW	PM 5-20-81		
		APPR		
		CUSTOMER WPBS 5-20-81		SHT 1 OF 1

DESCRIBE CHANGE AND GIVE REASON: REDUCE PHASE SHIFT

SHEET 9, ITEM 133

IS

1 RNC55J1001 DS RESISTOR, 1.0K ± 0.5%, 1/10 W R85

WAS

RNC55J6420DS RESISTOR, 642Ω ± 0.5%, 1/10 W R85

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QTY REQ				PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF. DES		ZONE	ITEM NO

Aerospace Systems Division — Western Laboratories

W L-4-5-A (1-78)

ENGINEERING ORDER

DIST CODE 010A RELEASED JUL 20 1981

DRAWING TITLE	JOB NO.	CODE IDENT NO.	EO
PARTS LIST, PRINTED WIRING BOARD ASSY SERVO ELECTRONICS, VHM (ANALOG)	2920	13126	1 PL200059B-3

TYPE OF EO	DISPOSITION OF PARTS			
[x] CHANGE	[ ] USE	ORIG GAUGHEN DATE 7/7/81	NEXT ASSY 200059	EFFECTIVITY SN 1 & UP
[ ] VARIANCE	[x] REWORK	CHECK WPBJ 7-20-81	MODEL NO.	
[ ] SUPERSEDING	[ ] SCRAP	ENGR 7-16-81		ECP
[ ] NOTED	[ ] NOTED BELOW	PM 7-20-81	OTHER DWG AFFECTED SCH200059, PL200059-	SHT 1 OF 1
		APPR		
		CUSTOMER WPAJ 7-20-81		

DESCRIBE CHANGE AND GIVE REASON: ENGINEERING REQUEST — PARTS AVAILABILITY
ADD ALTERNATE PARTS FOR R113, R114, R115
ADD R113A & R114A

ADD ITEM 165 — ITEM 165

4, RNC55JXXXX FS, ST11548, RESISTOR, S.A.T., ±1%, 1/10 W, R113, R114, R113A, R114A
27.4K, 28K, 28.7K, 29.4K, 30.1K, 30.9K, 31.6K, 32.4K, 33.2K,

CHANGE ITEM 223 FROM 5 REQD TO 7 REQD

ADD ITEM 177 — ITEM 177

1, RN55CUXXXXFS, ST11548, RESISTOR S.A.T., ±1%, 1/10 W, R115,
73.2K, 75K, 76.8K, 78.7K, 80.6K, 82.5K, 84.5K, 86.6K, 88.7K,

CHANGE ITEM 164 — ITEM 164

FROM QTY 2, REF DES R113, R114, TO QTY 4, REF DESIG R113, R114, R113A, R114A

C-3

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QTY	NOTED ASSY	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	CODE	ZONE	ITEM NO.

Aerospace Systems Division — Western Laboratories

W L-4-5-A (1-78)

ENGINEERING ORDER

DIST CODE 010A — RELEASED NOV 23 1981

DRAWING TITLE	JOB NO.	CODE IDENT NO.	EO
PARTS LIST - ANALOG UHM	2920	13126	PL 200059B-4

TYPE OF EO	DISPOSITION OF PARTS		DATE			EFFECTIVITY
☒ CHANGE	☐ USE	ORIG WPBJ	11-23-81	NEXT ASSY	200059	*
☐ VARIANCE	☒ REWORK	CHECK WPBJ	11-23-81	MODEL NO.		
☐ SUPERSEDING	☐ SCRAP	ENGRG [illegible]	11-23-81			ECP
☐ NOTED	☐ NOTED BELOW	PM [illegible]	11-23-81	OTHER DWG AFFECTED	200059	
		APPR [illegible]	[illegible]			SHT 1 OF 1
		CUSTOMER WPBJ	11-23-81			

DESCRIBE CHANGE AND GIVE REASON:

* SN 1 & UP
1. ADD ITEM 229
2. ADD CB4A TO ITEM 12, CHANGE QTY FROM: 1, TO: 2
* SN 2 ONLY

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	QTY REQ	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	CODE IDENT		ITEM NO.
CHANGE	2				CB4 CB4A			12
ADD	2	TYPE GEE .003 THK	MIL-P-18177	INSULATOR .2 X 1.00				229

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Ball Aerospace Systems Division — Western Laboratories

DIST CODE	PARTS LIST NO.	REV
010A	PL 200061	A

REVISIONS

EFF	REV	DESCRIPTION	BY	CK	DATE	APPD
SN1 & UP	A	INCORPORATED EO'S NC1 THRU NC5. ADDED ITEM NO. 93 & DELETED REF DES. 'C41' FROM ITEM 94 & CHANGED QTY REQD FROM 16 REQD TO 15 REQD. ITEMS 85 THRU 90 WAS: RBR56S IS: RBR56L		81 WPBJ	3-31-81	T.L. (QA) DA(WPBJ) WPBJ

1 PRESELECT CR26 & 27. MATCH V_Z WITHIN ±1% OF EACH OTHER AT 500 µA ±5%.

NOTES: UNLESS OTHERWISE SPECIFIED

APPLICATION	CONTRACT NO.		TITLE PARTS LIST: PRINTED WIRING [illegible] ASSY DIGITAL TIMING CONTROL & STATUS ISPM-VHM
NEXT ASSY	DRAWN PILGRIM, J.	7-18-80	
200061-01	CHECK WPBJ	10-20-80	
	MECH ENGR		
	ELECT ENGR	10-21-80	
FINAL ASSY	PROJ MGR		
200100	APPD	10-21-80	
	DESIGN ACTIVITY APPD WPBJ	10-20-80	
	CUSTOMER		

SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
A	13126	PL 200061	A

SCALE — RELEASED [illegible] SHEET 1 OF 8

4-3 (1-79)

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QTY REQD		01	PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
		1	200062-11		PRINTED WIRING, BD			1
								2
								3
		18	JANTXV1N4148	PT 40015	DIODE, SWITCHING, IN4148	CR1,2,3, 4,5,6,7,8,		4
						9,10,11,12, 13,23,24,		
						25,29,30.		
		8	JANTXV1N4150	MIL-S-19500/231	DIODE, SWITCHING, IN4150	CR15,16,17, 18,19,20,		5
						21,22.		
		1	JANTXV1N753A	ST 11715	DIODE, ZENER 6.2V IN753A	CR14		6
		2	JANTXV1N4569A	ST11728	DIODE, ZENER 6.4V IN4569A	CR26, 27.	1	7
		1	JANTXV1N4569A	ST11728	DIODE, ZENER 6.4V IN4569A	CR28		8
								9
								10
								11
								12
		16	ST11499-108AFBR	ST 11499	OP AMP, LM108AF, 10 PIN F/P	AR1,3,4,6, 7,9,11,12		13
						13,14,15,16 17,18,19,20		
		4	ST11869-139FBR	ST 11869	OP AMP, LM139, 14 PIN F/P	AR2,5, 8,10,		14
								15
								16
		1	G 4075 BR	PT40711 -1-B-S	I.C., TRIPLE OR GATE	U1		17
		1	G 4093 BR	PT40737 -1-B-S	I.C. SCHMITT TRIGGER	U2		18
		2	G 4049 BR	PT 40705 -1-B-S	I.C. HEX. INVERT. BUFF.	U3, U16		19
		1	G 4071 BR	PT40711 -1-B-S	I.C., QUAD. OR. GATE	U4		20
		3	G 4050 BR	PT40705 -2-B-S	I.C., HEX. BUFFER	U5, U11, U12.		21

TITLE: PARTS LIST: PRINTED WIRING ASSY DIGITAL TIMING CONTROL ISPM-VHM	SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
	A	13126	PL 200061	A
	SCALE —	RELEASED	2 OF 9	

W 1-43A (11-77)

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QTY REQD			PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
		01						
		1	G 4029 BR	PT 40707 -1-B-S	I.C., UP/DOWN, CNTR	U6		22
		1	G 4051 BR	PT 40728 -1-B-S	I.C., 8 CHL, MULTIPLEX	U7		23
		1	G 4001 BR	PT 40703 -1-B-S	I.C., QUAD, NOR GATE	U8		24
		3	G 4013 BR	PT 40701 -1-B-S	I.C., DUAL "D" F/F	U9, U10, U17		25
		2	G 4081 BR	PT 40710 -1-B-S	I.C., QUAD, AND GATE	U13, U25		26
		3	G 4027 BR	PT 40701 -2-B-S	I.C., DUAL, J-K, F/F	U14, U15, U24		27
		2	G 4034 BR	PT 40708 -2-B-S	I.C., 8 BIT UNIVERSAL BUS REGISTER	U18, U19		28
		1	G 4053 BR	PT 40728 -3-B-S	I.C., TRIPLE, 2 CHL, MUX	U26		29
								30
								31
								32
		1	TKR 178	ST11542	RESISTOR PACK, 100K, ±2%	U21		33
		2	TKR 217	ST11541	RESISTOR PACK, 10K, ±2%	U22, U23		34
								35
								36
		16	RNC55H1002FS	ST11548	RESISTOR, 10K ±1%, 1/10 W,	R 8, 11, 12, 13, 26, 29, 30, 31, 44, 47, 48, 49, 84, 97, 110, 133		37
		8	H2002FS	ST11548	20K ±1% W	R4, 5, 22, 23, 40, 41, 131, 132		38
		3	H1273FS	ST11548	127K ±1%, W	R16, 34, 52		39
		1	H5112FS	ST11548	51.1K ±1%, W	R55		40
		1	RNC55H7502FS	ST11548	RESISTOR, 75K, ±1%, 1/10 W	R73		41

TITLE: PARTS LIST: PRINTED WIRING ASSY DIGITAL TIMING CONTROL TSPM-VHM	SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
	A	13126	PL 200061-	A
	SCALE --	RELEASED	3	OF 3

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QTY REQD 01	PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
1	RNC55H1783FS	ST11548	RESISTOR, 178K±1% 1/10W	R72		42
1	H9532FS	ST11548	95.3K±1%	R74		43
1	H1503FS	ST11548	150K±1%	R75		44
2	H2371FS	ST11548	2.37K±1%	R77, R78		45
6	H5111FS	ST11548	5.11K±1%	R80, 81, 93, 94, 106, 107		46
6	H1003FS	ST11548	100K±1%	R82, 83, 95, 96, 108, 109		47
				-		48
3	H3012FS	ST11548	30.1K±1%	R85, 99, 112		49
1	H3161FS	ST11548	3.16K±1%	R117		50
2	H1183FS	ST11548	118K±1%	R124, 127		51
1	H3742FS	ST11548	37.4K±1%	R130		52
1	H1402FS	ST11548	14K±1%	R134		53
1	H4991FS	ST11548	4.99K±1%	R138		54
1	H8452FS	ST11548	84.5K±1%	R146		55
1	RNC55H1692FS	ST11548	RESISTOR, 16.9K±1% 1/10W	R147		56
						57
						58
6	RNC55HXXXXFS	ST11548	RESISTOR SAT. ±1% 19.1K, 19.6K, 20K, 20.5K, 21.0K,	R7, 15, 25, 33, 43, 51	NOM	59
1	HXXXXFS	ST11548	SAT ±1% 54.9Ω, 110Ω, 165Ω, 174Ω, 215Ω,	R137	NOM	60
1	RNC55HXXXXFS	ST11548	RESISTOR, SAT 6.04K±1% NOM 1.21K, 2.43K, 3.65K, 4.87K, 6.04K, 7.32K, 8.45K, 9.76K, 11.0K, 12.1K,	R113	NOM	61

TITLE: PARTS LIST: PRINTED CURCUIT ASSY DIGITAL TIMING CONTROL TSPM-VHM	SIZE A	CODE IDENT NO. 13126	PARTS LIST NO. PL 200061	REV A
	SCALE ———	RELEASED	SHEET 4 OF 8	

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QTY REQD		Δ1	PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
		2	RNC55HXXXXFS	ST 11548	RESISTOR, SAT. ±1%	R90, R105		62
			40.2K, 51.1K, 64.9K, 82.5K, 100K, 121K, 130K, 140K, 909K, 1MEG 150K, 162K, 187K, 200K, 301K, 402K, 499K, 604K, 806K.					
		2	RNC55JXXXXFS	ST 11548	RESISTOR, SAT. 69.8K ±1%	R89, 102	10M	63
			30.1K 33.2K, 37.4K, 42.2K, 47.5K, 53.6K 60.4K, 68.1K, 76.8K, 86.6K, 100K					
		2	RNC55JXXXXFS	ST 11548	RESISTOR, SAT, ±1%	R91		64
				604Ω	100Ω, 200Ω, 402Ω 499Ω 909Ω 698Ω 806Ω, 1KΩ ±1%	R104		
		1	RNC55J1913DS	ST11548	RESISTOR, ±25PPM 191K ±0.5%	R114		66
		1	J2983DS	ST11548	±25PPM 298K ±0.5%	R116		67
		1	J1023DS	ST11548	±25PPM 102K ±0.5%	R115		68
		2	J6042DS	ST11548	±25PPM 60.4K ±0.5%	R118, R119		69
		2	J1003DS	ST11548	±25PPM 100K ±0.5%	R120 122		70
		1	RNC55J4992DS	ST11548	RESISTOR. ±25PPM 49.9K ±0.5%	R121		71
		2	RNC55J1003BS	ST11548	RESISTOR, ±25 PPM 100K ±0.1% 1/10W	R103, 92		72
		2	RNC55H XXXXFS	ST 11548	RESISTOR SAT ±1%	R123, R126		73
			100Ω, 200Ω, 301Ω, 402Ω, 499Ω, 604Ω, 698Ω, 806Ω, 909Ω, 1K, 69.8K, 80.6K, 90.9K 100K, 4.99K, 10K, 20K, 30.1K 40.2K, 49.9K, 60.4K					
		38	RCR05G103JS	ST11751	RESISTOR, 10K ±5% 1/8W	R1, 3, 6, 14, 19, 21, 24, 32, 37, 39, 42, 50, 59, 60, 61, 76, 79, 87, 88, 125, 129	2, 20, 38, 128,	75
					R148 - R160			
		8	G203JS	ST 11751	20K ±5%	R10, 18, 28, 36, 46, 54, 140, 144		76
		6	G106JS	ST 11751	10M ±5%	R9, 17, 27, 35, 45, 53		77
		3	G105JS	ST 11751	1M ±5%	R86, 98, 111		78
		3	RCR05G104JS	ST11751	RESISTOR, 100K ±5% 1/8W	R56, 57, 58		79

TITLE: PARTS LIST: PRINTED WIRING ASSY DIGITAL TIMING CONTROL TSPM-VHM	SIZE A	CODE IDENT NO. 13126	PARTS LIST NO. PL 200061	REV A
	SCALE —	RELEASED	SHEET 5 OF 8	

W [illegible] (11-77)

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QTY REQD		01	PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
		1	RCR05G102JS	ST 11751	RESISTOR. 1K ±5% 1/8W	R69		80
		3	G513JS	ST11751	51K ±5%	R62, 63. 64		81
		3	G683JS	ST 11751	68K ±5%	R65, 66 67		82
		1	G222JS	ST11751	2.2K ±5%	R68		83
		1	RCR05GXXXJS	ST 11751	RESISTOR SAT ±5%	R141	NOM	84
					2.0M, 2.4M, 3.0M, 3.6M 4.3M 5.1M			
		1	RBR56L28001FR	ST 11769	WIREWOUND RESISTOR 28.0K ±1%	R100		85
		1	L45301FR	ST11769	45.3K ±1%	R101		86
		1	L13001FR	ST11769	13.0K ±1%	R135		87
		1	L47501FR	ST 11769	47.5K ±1%	R139		88
		3	L20001FR	ST 11769	20.0K ±1%	R 142 143 145		89
		1	RBR56LXXXXXFR	ST 11769	WIREWOUND RESISTOR SAT ±1% 1/8W	R136	NOM	90
					4.42K, 4.64K 4.87K, 5.11K, 536K			
								91
								92
		1	M39014/01-1351	ST11560	CERAMIC CAPACITOR 470PF, 200V ±10%	C41		93
		15	M39014/01-1339	ST11560	CERAMIC CAPACITOR 100PF/200V ±10%	C 1, 4, 7, 10, 13, 16,		94
						19, 22, 27, 31, 35, 38		
						45, 48, 51.		
		6	01-1593	ST 11560	.1uF/50V ±10%	C 2, 3, 8, 9, 14, 15		95
		20	01-1575	ST 11560	.01uF/100V ±10%	C 20, 21, 23, 24, 28, 29		96
						32, 33, 36 37, 39, 40		
						42, 43, 44 46, 47, 49		
						50, 52		
		7	M39014/02-1419	ST11561	CERAMIC CAPACITOR 1uF/50V ±10%	C5, 6, 11 12, 17, 18,	54,	97

TITLE: PARTS LIST: PRINTED WIRING ASSY DIGITAL TIMING CONTROL ISEM-VHM	SIZE: A	CODE IDENT NO.: 13126	PARTS LIST NO.: PL 200061	REV: A
	SCALE: ——	RELEASED	SHEET 6 OF 8	

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QTY REQD			PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
		01						
								98
		1	M39003/01-3006	ST 11700	TANTALUM CAPACITOR 10uf/20V±10%	C53		99
								100
								101
								102
		1	CCR05CG182FR	MIL-C-20/35	NPO CAPACITOR, 1800pf/100V±1%	C26		103
		2	↕ 6CG103FR	↕	↕ .01uf/50V±1%	C25,30		104
		1	CCR06CG392FR	MIL-C-20/35	NPO CAPACITOR, 3900pf/100V±1%	C34		105
								106
								107
								108
		1	MDM51PH001BA141	CANNON	CONNECTOR, 51 PIN	J2		109
		1	MDM37PBRPA141	CANNON	↕ 37 PIN	J3		110
		1	MDM51SBSP-A141	CANNON	CONNECTOR, 51 PIN	J9		111
								112
								113
		4	MS35649-224		NUT, HEX #2-56	J-3 J-9		114
								115
								116
		4	MS35338-134		WASHER, LOCK #2	J-3, J-9		117
								118
								119
		4	NAS620C2		WASHER, FLAT #2	J3, J9		120
								121
								122

TITLE	SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
PARTS LIST: PRINTED WIRING ASSY DIGITAL TIMING CONTROL [illegible] VHM	A	13126	PL 200061	A
	SCALE —	RELEASED	7 OF 8	

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QTY REQD		01	PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
		2	MS51957-6		SCREW, P.H. #2-56X7/16	J9		123
		2	MS51957-7		SCREW, P.H #2-56X1/2	J3		124
								125
								126
								127
								128
								129
								130
		REF	S200078		SPEC.SCREENING			131
		REF	SCH 200061		SCHEMATIC			132
		REF		S43024	SPEC, BONDING			133
		REF		S43040	SPEC. FABRICATION			134
								135
		AR	0151	S43024	EPOXY, PATCH (HYSOL)			136
		AR	ABLEFILM 517	ABLESTIK	TAPE, ADHESIVE			137
		AR	50,000 SERIES	WORNOW PROCESS	CATALYST NO.9			138
		AR	50,000 SERIES	PAINT CO.	CAT-L-INK EPOXY			139
		AR	SN 63	QQ-S-571	SOLDER			140
		AR	113/300	S43028	SOLITHANE			141
								142
		REF		S40111	SPEC, IDENTIFICATION			143
		REF		S43028	SPEC, CONFORMAL COAT			144
		REF	200061		WIRING DIAGRAM			145
		REF	S200061		SPEC, TEST			146
		REF	NBH5300.4(3A-1)		SPEC, SOLDER			147

TITLE: PARTS LIST: PRINTED WIRING ASSY, ASSY, DIGITAL TIMING TSPM VHM	SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
	A	13126	PL 200061	A
	SCALE —	RELEASED		8 OF 8

Aerospace Systems Division — Western Laboratories

W L-4-5-A (1-78)

ENGINEERING ORDER

DIST CODE 010A RELEASED: [illegible]

DRAWING TITLE	JOB NO.	CODE IDENT NO.	
PARTS LIST, PRINTED WIRING ASSY DIGITAL TIMING CONTROL & STATUS	2920	13126	EO — PL200061A-1

TYPE OF EO	DISPOSITION OF PARTS			
[X] CHANGE	[ ] USE	ORIG GAUGHEN DATE 7/7/81	NEXT ASSY 200061	EFFECTIVITY
[ ] VARIANCE	[X] REWORK	CHECK WPBS 7-20-81	MODEL NO.	SN 1 & UP
[ ] SUPERSEDING	[ ] SCRAP	ENGR [signature]		
[ ] NOTED	[ ] NOTED BELOW	PM [signature] 7/13/81		
		APPR [signature] 7/13/81	OTHER DWG AFFECTED 200061 SCH200061	ECP
		CUSTOMER WPBS 7-20-81		SHT 1 OF 1

DESCRIBE CHANGE AND GIVE REASON: ENGINEERING REQUEST — ADD CAPACITOR C55 AND INSULATION TUBING

ADD ITEM 107

1, CYFR10S101F, CAPACITOR, 100PF ±1%, 500V, C55, 107

ADD ITEM 128

AR, AMS-3654-22, —, TUBING, INSULATION, 128

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QTY REQ	NOTED ASSY	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	CODE ID	ZONE	ITEM NO.

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Ball Aerospace Systems Division — Western Laboratories

DIST CODE	PARTS LIST NO.	REV
010A	PL 200050	B

REVISIONS

EFF	REV	DESCRIPTION	BY	CK	DATE	APPD
1 & UP	A	ITEM 8 WAS QTY 7, 3.3UH L1-L7. ITEM 10 ADDED ITEM 16 WAS QTY 29, CR4, 6-12, 14-31. ITEM 28 DELETE ITEM 37 ADDED ITEM 55 WAS 27R1 27.1Ω ITEM 69 WAS -1346 .056uf				
1 & UP	B	INCORPORATED EO'S A1-A5. ADDED ITEM 62.			4 APR 1985	D.A.

MAR 10 1982

2 SELECT AT TEST: RANGE 220PF, 270PF, 330PF, 390PF, 470PF

1. ALL JPL SPECIFICATIONS WILL BE IDENTIFIED BY "PT" OR "ST" SERIES DESIGNATORS.

NOTES: UNLESS OTHERWISE SPECIFIED

APPLICATION	CONTRACT NO. 2920		TITLE
NEXT ASSY	DRAWN	10 MAR 80	PARTS LIST, LOW VOLTAGE POWER SUPPLY-VHM
200042-01	CHECK	23 APR 80	
	MECH ENGR		
	ELECT ENGR		
FINAL ASSY	PROG MGR		
200001	APPD		
	DESIGN ACTIVITY APPD WPBJ		
	CUSTOMER		

SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
A	13126	PL 200050	B

SCALE — RELEASED SHEET 1 OF 5

1.5 HRS

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QTY REQD		-01	PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
		1	200051-11		PRINTED WIRING BD			1
								2
								3
		1	200230		XMFR, POWER	T3		4
		1	200231		XMFR, DRIVE	T2		5
		1	200232		XMFR, RAMP GEN	T1		6
		1	200238-11		SPACER, XMFR			7
		6	200229		INDUCTOR, 3.3UH	L1-L6		8
		2	200236		INDUCTOR, 1UH	L8,9		9
		1	200254		INDUCTOR, 830UH	L7		10
		1	G4027BR	PT40701	I.C.- DUAL J-K PRESENT AND CLEAR	U1		11
		1	G4049UBR	PT40705	I.C.- HEX INVERTER	U2		12
		1	CD4046BK/1SJ	RCA	I.C.- MICROPOWER, PHASE LOCKED-LOOP	U3		13
		1	MDM9PH001F-A141	CANNON	CONNECTOR, 9 PIN	J7		14
		1	MDM31PH001B-A141	CANNON	CONNECTOR. 31 PIN	J8		15
		30	FD643	ST11330	DIODE, SIGNAL	CR1-4, 6-12, 14-31, 36		16
		1	JANTXV1N757A	ST11715	DIODE, 9.1V ZENER	CR5		17
		1	JANTXV1N5290	MIL-S-19500/463	DIODE, CURRENT REG	CR13		18
		2	JANTXV1N4569A	ST11728	DIODE, ZENER, 6.4V	CR32,37		19
		1	JANTXV1N4121	ST11860	DIODE, ZENER, 32V	CR33		20
		2	JANTXV1N821	ST11724	DIODE, ZENER, 6.2V	CR34,35		21
								22
								23
		6	JANTXV2N2222A	ST11790	TRANSISTOR, NPN	Q1-5,8		24
		2	JANTXV2N3501	ST11801	TRANSISTOR, NPN	Q6,7		25

TITLE: PARTS LIST- LOW VOLTAGE POWER SUPPLY, VHM	SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
	A	13126	PL200050	B
	SCALE —	RELEASED	SHEET 2	5

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QTY REQD		-01	PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
		1	RCR07G510JS	ST11752	RESISTOR-51Ω, 1/4W, ±5%	R1		26
		1	RCR05G513JS	ST11751	51K, 1/8W,	R2		27
		1	RCR05G512JS	ST11751	5.1K, 1/8W	R40		28
		1	RCR05G104JS	ST11751	100K, 1/8W,	R6		29
		1	RCR05G203JS	ST11751	20K, 1/8W,	R7		30
		1	RCR05G152JS	ST11751	1.5K, 1/8W,	R12		31
		1	RCR05G511 JS	ST11751	510Ω, 1/8W,	R17		32
		1	RCR07G101JS	ST11751	100Ω, 1/4W,	R18		33
		5	RCR05G103 JS	ST11751	10 K, 1/8W,	R19, 29, 32, 38, 41		34
		1	RCR07G681JS	ST11752	RESISTOR-680Ω, 1/4W, ±5%	R20		35
		1	RCR05G472JS	ST11751	RESISTOR, 4.7K, 1/8W, ±5%	R29		36
		1	RNC55H8251FS		RESISTOR, 8.25K 1/10W ±1%	R5		37
								38
		2	RNC55H3651FS	ST11548 OR MIL-R-55182/1	RESISTOR-3.65K, 1/10W, ±1%	R3, 4		39
		1	RNC55H4992FS		49.9K,	R8		40
		1	RNC55H39R2FS		39.2Ω,	R9		41
		2	RNC55H1003FS		100K,	R10, 13		42
		2	RNC55H2742FS		27.4K,	R11, 14		43
		1	RNC55H1210FS		121Ω,	R15		44
		1	RNC55H2000FS		200Ω,	R16		45
		1	RNC55H9093FS		909K,	R25		46
		1	RNC55H2001FS		2K,	R21		47
		1	RNC55H1100 FS		110 Ω,	R22		48
		1	RNC55H1132FS		11.3K,	R23		49
		1	RNC55H1004FS	ST11548 OR MIL-R-55182/1	RESISTOR-1MΩ, 1/10W, ±1%	R24		50

TITLE	SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
PARTS LIST - LOW VOLTAGE POWER SUPPLY, VHM	A	13126	PL 200050	B
	SCALE —	RELEASED	SHEET 3 OF 5	

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QTY REQD			PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
		-01						
		1	RNC55H3091FS	ST11548 OR MIL-R-55182/1	RESISTOR-3.09K, 1/10W, ±1%	R26		51
		1	RNC55H2611FS		2.61K, 1/10W, ±1%	R27		52
		1	RNC55HXXXXFS		10K-100K S.A.T., 1/10W, ±1%	R28		53
		2	RNC55H2001FS	ST11548 OR MIL-R-55182/1	RESISTOR-2.0K, 1/10W, ±1%	R30, 31		54
		1	RNC55H27R4FS	ST11548 OR MIL-R-55182/1	RESISTOR-27.4Ω, 1/10W, ±1%	R39		55
		1	ST11869-139FBR	ST11869	OP AMP (LM139)	AR1		56
		1	ST11499-108AFBR	ST11499	OP AMP (LM108AF)	AR2		57
								58
		3	M39003/01-3138	MIL-C-39003/1	CAPACITOR-10UF, 75V, ±10%	C1, 13, 14		59
		9	M39003/01-3006	MIL-C-39003/1	CAPACITOR-10UF, 20V, ±10%	C6-8, 19, 21, 23, 25-27		60
								61
		1	M39014/01-1575	ST11560	CAPACITOR-.01uF, 100V, ±10%	C31		62
		1	M39014/01-1345	MIL-C-39014/1	CAPACITOR-220PF, 200V, ±10%	C2		63
		1	M39014/01-1335	MIL-C-39014/1	CAPACITOR-56PF, 200V, ±10%	C3		64
		1	M39014/01-1339	MIL-C-39014/1	CAPACITOR-100PF, 200V, ±10%	C5		65
		8	M39014/01-1593	MIL-C-39014/1	CAPACITOR-.1UF, 50V, ±10%	C9, 11, 17, 18, 20, 22, 24, 28		66
		1	M39014/02-1343	MIL-C-39014/2	CAPACITOR-.033UF, 100V, ±10%	C15		67
		1	M39014/02-1347	MIL-C-39014/2	CAPACITOR-.068UF, 100V, ±10%	C16		68
		1	M39014/02-1334	MIL-C-39014/2	CAPACITOR-.0056UF, 100V, ±10%	C29		69
		1	M39014/01-1581	MIL-C-39014/1	CAPACITOR-.022UF, 50V, ±10%	C30		70
		1	CCR05CGXXXJR	MIL-C-20/35	CAPACITOR-XXXPF, 100V, ±5%	C4	2	71
		1	CCR05CG681JR	MIL-C-20/35	CAPACITOR-680PF, 100V, ±5%	C10		72
		1	CCR05CH3R3JR	MIL-C-20/35	CAPACITOR-3.3PF, 200V, ±5%	C12		73
		5	10018	MILTON ROSS	TRANSIPAD			74
		2	260-4TH5B	WAKEFIELD	HEATSINK (TO-5)			75

TITLE:	SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
PARTS LIST-LOW VOLTAGE POWER SUPPLY, VHM	A	13126	PL 200050	B

RELEASED

SHEET 4 OF 5

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QTY REQD		-01	PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
		A/R	50,000 SERIES	WORNOW PROCESS	CATALYST NO.9			76
		A/R	50,000 SERIES	PAINT CO.	CAT-L-INK, EPOXY			77
		A/R	C113-300	S43028	SOLITHANE			78
		A/R	0151	S43024	EPOXY PATCH (HYSOL)			79
		A/R	SN63	QQ-S-571	SOLDER			80
		A/R	ABLEFILM 517	ABLESTIK	TAPE, ADHESIVE			81
		A/R	20096	GUDEBROD	LACING TAPE, WHITE			82
		A/R	26 AWG, TYPE S	QQ-W-343	WIRE, BUS			83
								84
		A/R	AMS 3654-22		TUBING, INSULATION			85
		REF	S200050		SPEC, TEST			86
		REF	S 200078		SPEC, SCREENING			87
		REF		S40111	SPEC, IDENTIFICATION			88
		REF		S43024	SPEC, BONDING			89
		REF		S43028	SPEC, CONFORMAL COAT			90
		REF	NHB5300.4(3A-1)		SPEC, SOLDER			91
		REF	SCH200050		SCHEMATIC			92
		A/R	26 AWG, TYPE E	MIL-W-16878/4	WIRE, INSULATED			93
								94
		2	MS35214-12		SCREW, PH 4-40×3/16, B.B.O.			95
		2	NAS620-84		WASHER, FLAT #4, B.B.O.			96
		2	MS35338-97		WASHER, LOCK #4, B.B.O.			97
								98
								99
								100

TITLE: PARTS LIST - LOW VOLTAGE POWER SUPPLY, VHM	SIZE: A	CODE IDENT NO.: 13126	PARTS LIST NO.: PL200050	REV: B
	SCALE —	RELEASED	SHEET 5 OF 5	

Aerospace Systems Division Western Laboratories

W L-4-5-A (1-78)

ENGINEERING ORDER

JUST CODE 010A RELEASED [illegible]

DRAWING TITLE	JOB NO.	CODE IDENT NO.	
PARTS LIST, LVPS VHM	2920	13126	EO — PL 200050 B-1

TYPE OF EO	DISPOSITION OF PARTS				
☒ CHANGE	☒ USE	ORIG WPBJ	DATE 6-26-81	NEXT ASSY 200042	EFFECTIVITY SN 1 & UP
☐ VARIANCE	☐ REWORK	CHECK WPBJ	6-26-81	MODEL NO.	
☐ SUPERSEDING	☐ SCRAP	ENGR [signature]	6-26-81		
☐ NOTED	☐ NOTED BELOW	PM [signature]	6-26-81	OTHER DWG AFFECTED —	ECP
		APPR RKM QA			
		CUSTOMER WPBJ	6-26-81		SHT 1 OF 1

DESCRIBE CHANGE AND GIVE REASON: DRAFTING ERROR + PART AVAILABILITY

1. ITEM 34: CHANGE QTY, FROM 5 TO 4
   DELETE R29 FROM ELECT REF DES COLLUMN

2. CHANGE ITEM 73

			PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	CODE	ZONE	ITEM
WAS			CCR05CH3R3JR	MIL-C-20/35	CAPACITOR, 3.3PF, 200V ±5%	C12			73
IS			CYFR10S3R3CR	MIL-C-23269/1	CAPACITOR, 3.3PF, 500V, ±.25PF	C12			73

W L-4-5-A (1-78)

Aerospace Systems Division — Western Laboratories

ENGINEERING ORDER

DIST CODE 010A — RELEASED JUL 24 1981

DRAWING TITLE	JOB NO.	CODE IDENT NO.	EO
PARTS LIST — LOW VOLTAGE POWER SUPPLY — VHM	2920	13126	PL 200050B-2

TYPE OF EO	DISPOSITION OF PARTS			
☒ CHANGE	☐ USE	ORIG GAUGHEN DATE 6/30/81	NEXT ASSY 200056-1	EFFECTIVITY SN 1 & UP
☐ VARIANCE	☒ REWORK	CHECK WPBJ 7-21-81	MODEL NO.	
☐ SUPERSED'NG	☐ SCRAP	ENGR 7-21-81		ECP
☐ NOTED	☐ NOTED BELOW	PJ 7-23-81	OTHER DWG AFFECTED 200050	SHT 1 OF 1
		APPR		
		CUSTOMER WPBJ 7-23-81		

DESCRIBE CHANGE AND GIVE REASON: PART MUST BE OMITTED TO ACHIEVE .53 DIMENSION
DELETE ITEM 7.

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ITEM 7 WAS:

QTY OF -01	PART NO.	SPECIFICATION	DESCRIPTION	ELEC/REF DES	CODE	ZONE	ITEM NO.
1	200238-11		SPACER, XMFR				7

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Ball Aerospace Systems Division — Western Laboratories

DIST CODE	PARTS LIST NO.	REV
010A	PL 200043	A

REVISIONS

EFF	REV	DESCRIPTION	BY	CK	DATE	APPD
-15UP	A	INCORPORATED EO'S NC1- NC-3	SV	[illegible]	14 APR 81	D.A.

2. THESE (±1%) RESISTORS ARE FURNISHED AND SELECTED BY THE CUSTOMER.

1. ALL JPL SPECIFICATIONS WILL BE IDENTIFIED BY "PT" OR "ST" SERIES DESIGNATORS.

NOTES: UNLESS OTHERWISE SPECIFIED

APPLICATION			
NEXT ASSY	CONTRACT NO. 2920		TITLE
200042-01	DRAWN	7 MAR 80	PARTS LIST- HEATER BOARD, VHM
	CHECK	23 APR 80	
	MECH ENGR	5-15-80	
	ELECT ENGR	7-7-80	
FINAL ASSY	PROJ MGR	8-6-80	
200001	APPD	8-5-80 / 8/6/80	
	DESIGN ACTIVITY APPD WPBJ	8-6-80	
	CUSTOMER		

SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
A	13126	PL 200043	A

SCALE — RELEASED SHEET 1 OF 4

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QTY REQD		-01	PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
		1	200044-01		PRINTED WIRING BD			1
								2
								3
		1	RCR20G390JS	MIL-R-39008/2	RESISTOR-39Ω, 1/2W ±5%	R1		4
		1	RCR20G512JS	MIL-R-39008/2	RESISTOR-5.1K, 1/2W ±5%	R2		5
		1	RNC55H2051FS	ST11548 OR MIL-R-55182/1	RESISTOR-2.05K, 1/10W, ±1%	R3		6
		1	RCR05G___JS	ST11751	RESISTOR-S.A.T, 1/8W, ±5%	R4		7
		1	RNC55H2212FS	ST11548 OR MIL-R-55182/1	RESISTOR-22.1K, 1/10W, ±1%	R5		8
		2	RCR05G102JS	ST11751	RESISTOR- 1 K, 1/8W, ±5%	R6, 7		9
		1	RNC55H8452FS	ST11548 OR MIL-R-55182/1	RESISTOR-84.5K, 1/10W, ±1%	R8		10
		1	RNC55H____FS	ST11548 OR MIL-R-55182/1	RESISTOR-S.A.T, 1/10W, ±1%	R9		11
		1	RCR05G682JS	ST11751	RESISTOR-6.8K, 1/8W, ±5%	R10		12
		1	RCR05G202JS	ST11751	RESISTOR-2K, 1/8W, ±5%	R11		13
		1	RNC55H10R0FS	ST11548 OR MIL-R-55182/1	RESISTOR-10Ω, 1/10W ±1%	R12		14
		4	RCR05G103JS	ST11751	RESISTOR-10K, 1/8W, ±5%	R13-16		15
		2	RNC55H1002FS	ST11548 OR MIL-R-55182/1	RESISTOR-10K, 1/10W, ±1%	R17, 18		16
		2	RCR05G330JS	ST11751	RESISTOR-33Ω, 1/8W, ±5%	R19, 22		17
		2	RNC55H1403FS	ST11548 OR MIL-R-55182/1	RESISTOR-140K, 1/10W ±1%	R20, 21		18
								19
		2	RCR05G106JS	ST11751	RESISTOR-10M, 1/8W, ±5%	R23, 24		20
								21
		4	ST11499-LM108AFBR	ST11499	I.C.-OP AMP (LM108A)	AR1-AR4		22
								23
								24
		1	JANTXV2N2222A	ST11790	TRANSISTOR, NPN	Q1		25

TITLE: PARTS LIST-HEATER BOARD, VHM	SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
	A	13126	PL200043	A
	SCALE —		RELEASED	SHEET 2 OF 4

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QTY REQD		-01	PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
		1	JANTXVIN[illegible]63B	ST11716	DIODE, REGULATOR	CR1		26
		1	JANTXVIN4148	PT40015	DIODE, SWITCHING	CR2		27
								28
								29
								30
								31
		1	M39003/01-3076	MIL-C-39003/1	CAPACITOR-1UF, 50V, ±10%	C1		32
		1	M39003/01-3120	MIL-C-39003/1	CAPACITOR-1UF, 75V, ±10%	C2		33
		2	M39014/01-1575	MIL-C-39014/1	CAPACITOR-.01UF, 100V, ±10%	C3,4		34
		4	M39014/01-1339	MIL-C-39014/1	CAPACITOR-100PF, 200V, ±10%	C6,8,9,11		35
		2	M39014/01-1593	MIL-C-39014/1	CAPACITOR-.1UF, 50V, ±10%	C7,10		36
								37
								38
		1	4018-15	THERM-ALLOY	BeO INSULATOR	(TO-18)		39
		AR	2[illegible]AWG, TYPE:S	QQ-W-343	WIRE, BUS			40
		AR	AMS3654-22		TUBING, INSULATION			41
		A/R	50,000SERIES	WORNOW PROCESS	CATALYST NO. 9			42
		A/R	50,000SERIES	PAINT CO.	CAT-L-INK, EPOXY			43
		A/R	CU3-300	S43028	SOLITHANE			44
		A/R	0151	S43024	EPOXY PATCH (HYSOL)			45
		A/R	SN63	QQ-S-571	SOLDER			46
		A/R	ABLEFILM 517	ABLESTIK	TAPE, ADHESIVE			47
								48
								49
								50

TITLE:	SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
PARTS LIST-HEATER BOARD, VHM	A	13126	PL 200043	A
	SCALE —	RELEASED	SHEET 3	OF [illegible]

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QTY REQD			PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
		01						
		REF		S40111	SPEC, IDENTIFICATION			51
		REF		S43024	SPEC, BONDING			52
		REF		S43028	SPEC, CONFORMAL COAT			53
		REF	NHB5300.4(3A-1)		SPEC, SOLDER			54
		REF	SCH200050		SCHEMATIC			55
		REF	S200078		SPEC. SCREENING			56
								57
								58
								59
								60
								61
								62
								63
								64
								65
								66
								67
								68
								69
								70
								71
								72
								73
								74
								75

TITLE: PARTS LIST-HEATER BOARD, VHM	SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
	A	13126	PL200043	A
	SCALE —		RELEASED	SHEET 4 1

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Ball Aerospace Systems Division — Western Laboratories	DIST CODE	PARTS LIST NO. PL 200053	REV B

REVISIONS

EFF	REV	DESCRIPTION	BY	CK	DATE	APPD
1 & UP	A	ITEM 4: ADDED 1 QTY. 1025-28. 2.2UH, L8. ⑥ ITEM 5: WAS-2 QTY. 200225. .34 UH, L8. ITEM 6: WAS-1 QTY. 200226. 2UH. L7. ITEM 7: WAS-1 QTY. 200227. .87UH, L12. ITEM 8: WAS-2 QTY. 200243. .30UH. L-15, L-16. ITEM 11: WAS-2 QTY. 1025-24. 1.5UH L3, L4, ITEM 12: WAS 5 QTY. 1025-44. 10UH. L6, 9, 10, 11, 13. ITEM 13: ADDED 2 QTY. 1025-44. 10 UH. L9, L13. ITEM 16: ADDED ⑤. ITEM 18: ADDED ②. WAS 2 QTY JANTXV 2N2905A, Q3, Q5 ITEM 19: ADDED ④. ITEM 20: WAS 1 QTY-JANTXV2222A, ST11790, Q7. ITEM 21: ADDED 1 QTY-JANTXV 2N2905A, ST11890 TRANSISTOR PNP Q5 ③ ITEM 97 WAS 1 QTY. CYFR10S100J 10PF. C5 ITEM 98 DELETED C14 ITEM 99 WAS 1 QTY. CYFRXXX ~~SS~~ SAT 5.1, 6.2, 7.5, 10, 12, 15 PF 500V ±.25 PF, C8 ITEM 102: WAS 1 QTY. CYFR10SXXXJ. SAT 20, 24, 30, 36, 43, 47. PF 500V ±5%, C12. ITEM 103: DELETED C44, C45 (VALUE CHANGED) ITEM 105: WAS 1 QTY. CYFR15S 561J. 560 PF, C16. ITEM 106: DELETED C18 ITEM 107: WAS QTY 2, M39014/01-1575 .01UF C19/C23 ITEM 108: DELETED C-20. ITEM 111 WAS 1 QTY. CYFR10S 680J, 68 PF, C26 ITEM 112 DELETED C28,	9DP B2	[illegible]	11/12/80 11/13/80	D. Snyder 11/13/80

SEE SHEET 2 FOR CONTINUED REV "A" NOTES

NOTES: UNLESS OTHERWISE SPECIFIED SEE PAGE 4 FOR GENERAL NOTES.

APPLICATION				TITLE
NEXT ASSY	CONTRACT NO. 2920			PARTS LIST R.F. SUPPLY, VHM
200057-01	DRAWN [signature]		12 MAR 80	
	CHECK [signature]		NOV 11 80	MAR 1982
	MECH ENGR [signature]			
	ELECT ENGR			
FINAL ASSY	PROJ MGR D. Snyder		NOV 13 80	
200036	APPD			
	DESIGN ACTIVITY APPD			
	CUSTOMER			

SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
A	13126	PL 200053	B
SCALE —	RELEASED	SHEET 1	OF 9

WL 4-3 (1-79)

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DIST CODE	PARTS LIST NO.	REV
	PL 200053	B.

REVISION "A" CONTINUED: REVISIONS

EFF	REV	DESCRIPTION	BY	CK	DATE	APPD
1 & UP	A	ITEM 112 (CONT.) ADDED: 1 QTY. CYFR105470J, .47PF, 500V, ±5%, C14. ITEM 113 ADDED: 3 QTY CYRF105111J, 110 PF, 500V ±5% - C20, C44, C45, ITEM 76 ADDED 2 QTY. CYFR105XXXC, SAT, ±.25%, C30, C49. ITEM 77 ADDED - 2 QTY CYFR105XXXJ, SAT, ±5%, C30 C49 ITEM 79: ADDED 2 QTY, #8025, JOHANSON VARI-CAP 1.5 PF - 20 PF C19, C48 ITEM 81: ADDED 2 QTY CYFR105XXXC, SAT, ±.25PF, C28, C46. ITEM 82: ADDED 2 QTY. CYFR105XXXJ SAT, ±5%, C28, C46. ITEM 84: ADDED 1 QTY. CYFR105XXXC SAT ±.25PF, C18. ITEM 85: ADDED 1 QTY. CYFR105XXXJ SAT ±5%, C18. ITEM 86: ADDED 1 QTY. CYFR105XXXJ SAT. ±5% C17 ITEM 40: WAS 1 QTY RNC55H3570FS-357Ω ⅛W ±1% ITEM 39: WAS 1 QTY RNC55H2740FS-274K ⅛W ±1% ITEM 94 TO 118 WAS ITEM 26 TO 50 PP4			11/12/80 11/12/80	[illegible] 11/17/80
1 & UP	B	ITEM 5 WAS 1 QTY 200243-2, S200243, CHOKE, SAT, 2UH TO .6UH L5 ITEM 7 WAS 1 QTY 200243-3, S200243, CHOKE, .53UH, L12 ITEM 15 ADDED 1 QTY. JANTXV2N2219A, ST11892, TRANSISTOR, NPN, Q6, 7			11/19/80	11/24/80

NOTES: UNLESS OTHERWISE SPECIFIED SEE PAGE 4 FOR GENERAL NOTES

APPLICATION		CONTRACT NO.	
NEXT ASSY		DRAWN	
		CHECK	
		MECH ENGR	
		ELECT ENGR	
FINAL ASSY		PROJ MGR	
		APPD	
		DESIGN ACTIVITY APPD	
		CUSTOMER	

TITLE
PARTS LIST
R.F. SUPPLY
VHM

SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
A	13126	PL 200053	B
SCALE	RELEASED	SHEET 2 OF 9	

WL 4-3 (1-79)

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Ball Aerospace Systems Division — Western Laboratories

DIST CODE	PARTS LIST NO.	REV
	PL 200053	B

REVISION "B" CONTINUED

REVISIONS

EFF	REV	DESCRIPTION	BY	CK	DATE	APPD
12 UP	B	ITEM 17: WAS 2 QTY JANTXV2N2219A, ST11892, TRANSISTOR, NPN, Q2, Q6. ITEM 38 WAS 3 QTY RNC55H1002FS, ST11548 RESISTOR, 10K 1/10W ±1%, R4, R12, R21, R22, ITEM 54 WAS: A/R 540111, EPOXY RESIN ITEM 55 WAS A/R 540111, CARBON BLACK ITEM 77 WAS 2 QTY. CYFR105XXXJ, CORNING, CAP. SAT ±5%, 15PF, 20PF, 24PF, 27PF 30 PF, 33PF 36PF, 160PF, 200PF, 240PF 500V, C30, C49. ITEM 79 WAS 2 QTY, #8054 JOHANSON CAP, VAR 1.5PF TO 20PF C19, C48 ITEM 81 WAS 2 QTY. CYFR105XXXJ. CORNING. CAP. SAT ±.25PF, 2.7PF, 6.8PF, 10PF, 500V C28, C46, ITEM 82 WAS 2 QTY. CYFR105XXXJ, CORNING. CAP. SAT ±5%, 15PF, 20PF, 68PF, 82PF 100PF, 120PF 500V, C28, C46, ITEM 86: WAS 1 QTY. CYFR105XXXJ, CORNING, CAP. SAT ±5% 10PF, 18PF, 500V, C47 ITEM 88 ADDED: 1 QTY. CYFR105XXXJ CORNING, CAP. SAT ±5%, OPF, 10PF, 18PF 500V, C50 ITEM 94 WAS REF QTY. 1250-003, EMI FILTER 1500PF 100V, C1, C2, C23, C24. ITEM 95 WAS 2 QTY, M39014/01-1569, MIL-C-39014/1 CAP. 4700PF 100V ±10% C3, C7, C11. ITEM 96 WAS 1 QTY, M39014/01-1553, MIL-C-39014/1 CAP. 0.1UF, 50V ±10%, C29	[illegible]	[illegible] 11/19/80	11/19/80	[illegible] 11/19/80

NOTES: UNLESS OTHERWISE SPECIFIED SEE PAGE 4 FOR GENERAL NOTES.

APPLICATION	CONTRACT NO.	TITLE
NEXT ASSY	DRAWN	PARTS LIST RF SUPPLY VHM
	CHECK	
	MECH ENGR	
	ELECT ENGR	
FINAL ASSY	PROJ MGR	
	APPD	
	DESIGN ACTIVITY APPD	
	CUSTOMER	

SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
A	13126	PL 200053	B
SCALE —	RELEASED	SHEET 3 OF 9	

BL 4 3 (1-79)

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Ball Aerospace Systems Division — Western Laboratories	DIST CODE 010A	PARTS LIST NO. PL 200053	REV B

REVISIONS

EFF	REV	DESCRIPTION	BY	CK	DATE	APPD

7. PRE-SELECT FOR $BV_{CEO} > 60V$
6. PRE-SELECT FOR 2.2uh TO 2.4uh.
5. PRE-SELECT FOR $BV_{CEO} > 22V$.
4. PRE-SELECT FOR $F_T > 500MHZ$; $HFE > 18.5$ AT $IC = 160MA \pm 10MA$; $BV_{CEO} > 60V$
3. PRE-SELECT FOR $HFE > 150$ AT $IC = 80MA \pm 5MA$.
2. PRE-SELECT FOR $HFE > 150$ AT $IC = 160MA \pm 10MA$.
1. ALL JPL SPECIFICATIONS WILL BE IDENTIFIED BY "PT" OR "ST" SERIES DESIGNATORS.

NOTES: UNLESS OTHERWISE SPECIFIED

APPLICATION	CONTRACT NO. 2920		TITLE
NEXT ASSY	DRAWN	9-8-80	PARTS LIST- R.F. SUPPLY, VHM
200057-01	CHECK	9-13-80	
	MECH ENGR	9-9-80	
	ELECT ENGR	9-23-80	
FINAL ASSY	PROJ MGR	9-10-80	SIZE A — CODE IDENT NO. 13126 — PARTS LIST NO. PL 200053 — REV B
200036	APPD		
	DESIGN ACTIVITY APPD		SCALE — RELEASED
	CUSTOMER		SHEET 4 OF 9

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QTY REQD		-01	PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
		1	200054-11		PRINTED WIRING BD			1
		1	200244-11		CONDUCTOR PLATE			2
		3	200245-11		SPACER			3
		1	1025-28		CHOKE, 2.2UH ±10%	L8	6	4
		1	200243-2	S200243	CHOKE-SAT, 0.1UH TO 0.8UH	L5		5
								6
		1	200243-2	S200243	CHOKE SAT 0.1UH TO 0.8UH	L12		7
		2	200243-1	S200243	CHOKE, .30UH ±2%	L15, 16		8
								9
		2	1537-36	DELEVAN	CHOKE-10 UH ±10%	L1, L14		10
		1	1025-16	DELEVAN	CHOKE-.68UH ±10%	L3.		11
		5	1025-52.	DELEVAN	CHOKE-22UH ±10%	L4, L6, L7, L10, L11		12
		2	1025-44	DELEVAN	CHOKE 10.UH ±10%	L9 L13		13
								14
		1	JANTXV2N2219A	ST11892	TRANSISTOR, NPN	Q6	7	15
		1	JANTXV2N918	ST11788	TRANSISTOR, NPN	Q1	5	16
		1	JANTXV2N2219A	ST11892	TRANSISTOR, NPN	Q2		17
		1	JANTXV2N2905A	ST11890	TRANSISTOR, PNP	Q3.	2	18
		1	JANTXV2N3375	MIL-S-19500/341	TRANSISTOR, NPN	Q4	4	19
		1	JANTXV2N2219A	ST11872	TRANSISTOR, NPN	Q7		20
		1	JANTXV2N2905A	ST11890	TRANSISTOR, PNP	Q5	3	21
								22
		2	ST11499-723H	ST11499	VOLTAGE REG (LM723H)	AR1, 3		23
		2	ST11499-108AFBR	ST11499	OP AMPL (LM108AF)	AR2, 4		24
								25

TITLE	SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
PARTS LIST- R.F. SUPPLY, VHM	A	13126	PL 200053	B
	SCALE —	RELEASED	SHEET 5 OF 9	

L 4 3A (11 77)

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QTY REQD -01	PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
2	JANTXVIN4100	MIL-S-19500/435	DIODE, ZENER-7.5V	CR1,5		26
2	JANTXVIN4623	PT40434	DIODE, ZENER-4.3V	CR2,6		27
4	JANTXVIN4148	PT40015	DIODE, SWITCHING	CR3,4,7,8		28
						29
						30
						31
1	43602-1	BASD/WL 543602	CRYSTAL, 27MHZ	FL1		32
						33
						34
1	RNC55H6811FS	ST11548 OR MIL-R-55182/	RESISTOR-6.81K, 1/10W, ±1%	R1		35
1	RNC55H1502FS		-15K	R2		36
1	RNC55H6810FS		-681Ω	R3		37
4	RNC55H1002FS		-10K	R4,12,21,22		38
1	RNC55H4751FS		-4.75K 1/10W±1%	R5		39
1	RWR81S82R5F		-82.5Ω 1W ±1%	R6		40
2	RNC55H2000FS		-200Ω 1/10W±1%	R7,25		41
4	RNC55H1001FS		-1K	R8,9,15,23		42
2	RNC55H3011FS		-3.01K	R10,19		43
2	RNC55HXXXXFS		S.A.T.-3.65K,3.92K,4.22K,4.53K,4.87K,5.11K	R11,20		44
1	RNC55H5621FS		-5.62K	R13		45
1	RNC55H6191FS		-6.19K	R14		46
1	RNC55H3920FS		-392Ω	R16		47
2	RNC55H2001FS	ST11548 OR MIL-R-55182/	RESISTOR-2K, 1/10W, ±1%	R17,18		48
						49
						50

TITLE	SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
PARTS LIST-R.F. SUPPLY, VHM	A	13126	PL 200053	B
SCALE —	RELEASED		SHEET 6 OF 9	

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QTY REQD		-01	PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
		5	10122-DRP	MILTON ROSS	TRANSIPAD (TO-5)	FOR: FL1 Q2,3,5&6		51
		2	10018-DRP	"	TRANSIPAD, (TO-18)	FOR: Q1&Q7		52
		2	10247-DRP	"	TRANSIPAD (TO-100)	FOR: AR1&AR3		53
		A/R	50,000 SERIES	WORNOW	CATALYST, NO 9.			54
		A/R	———	PROCESS PAINT CO.	CAT-L-INK, EPOXY			55
		A/R	C113-300	S43028	SOLITHANE			56
		A/R	0151	S43024	EPOXY PATCH (HYSOL)			57
		A/R	SN63	QQ-S-571	SOLDER			58
		A/R	ABLEFILM 517	ABLESTIK	TAPE, ADHESIVE			59
		A/R	20096	GUDEBROD	LACING TAPE, WHITE			60
								61
		3	260-4TH5E	WAKEFIELD	INSULATED HEATSINK	FOR: Q3,5&6		62
		1	TBD		CONNECTOR ASSY SMA 29006BC	J5		63
		1	TBD		CONNECTOR ASSY SMA 29005BC	P6		64
		REF		S40111	SPEC, IDENTIFICATION			65
		REF		S43024	SPEC, BONDING			66
		REF		S43028	SPEC, CONFORMAL COAT			67
		REF	NHB5300.4(3A-1)		SPEC, SOLDER			68
		REF	SCH200053		SCHEMATIC			69
		A/R	26AWG TYPE:E	MIL-W-16878/4	WIRE INSULATED			70
		A/R	AMS 3654-22		TUBING INSULATION			71
		A/R	32001	ASTRO LAB	CABLE			72
		REF	29092-32-1BL	ASTRO LAB	ASSY PROCEDURE			73
		REF	200078	S200078	SCREEN, SPEC			74
								75

TITLE:	SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
PARTS LIST-R.F. SUPPLY, VHM	A	13126	PL 200053	B
	SCALE	RELEASED	SHEET 7 OF 9	

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QTY REQD		01	PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
		2	CYFR10SXXXC	CORNING	CAPACITOR, SAT. ±.25 pF	C30,C49		76
					2.7pF 6.8 pF 10pF, 500V			
		2	CYFR10SXXXJ	CORNING	CAPACITOR, SAT. ±5%	C30,C49		77
					OPF,15PF,20PF,24PF,27PF 30PF 33PF 36PF 160PF 200PF,240PF, 500V			
		2	CYFR15SXXXJ		CAPACITOR SAT ±5% 270 PF 300 PF	C30 C49		78
		2	JMCR 5342	JOHANSON	CAPACITOR, VARI (.6pF-10pF)	C19,C48		79
								80
		2	CYFR10SXXXC	CORNING	CAPACITOR, SAT. ±.25 pF	C28,C46		81
					0PF, 2.7PF, 6.8PF, 10PF, 500V			
		2	CYFR10SXXXJ	CORNING	CAPACITOR SAT ±5%	C28,C46		82
					15PF, 20PF 68PF, 500V			
								83
		1	CYFR10SXXXC	CORNING	CAPACITOR SAT ±.25PF	C18		84
					2.7PF, 6.8 PF, 10 PF 500V			
		1	CYFR10SXXXJ	CORNING	CAPACITOR, SAT ±5%	C18		85
					12 PF, 15PF, 16PF, 18PF, 20 PF, 500V			
		1	CYFR10SXXXJ	CORNING	CAPACITOR SAT ±5%	C47		86
					10 PF, 18PF, 27PF, 500V			87
		1	CYFR10SXXXJ	CORNING	CAPACITOR, SAT. ±5%	C-50		88
					0PF, 10PF, 18PF, 500V			89
								90
								91
								92
								93

TITLE: PARTS LIST R.F. SUPPLY VHM	SIZE A	CODE IDENT NO. 13126	PARTS LIST NO. PL 200053	REV B
	SCALE	RELEASED	SHEET 8 OF 9	

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QTY REQD -01	PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
4	REF ONLY	1250-003	EMI-FILTER 1500PF 100V	C1,2, 24,34		94
3	M39014/01-1569	MIL-C-39014/1	CAPACITOR-4700PF,100V,±10%	C3,7,11		95
3	M39014/01-1351	MIL-C-39014/1	-470PF,200V,±10%	C4,22,32		96
1	CYFR10S8R2G	CORNING	-8.2PF,500V,±.25pF	C5		97
1	CYFR10S300J	CORNING	-30PF,500V,±5%	C6,		98
1	CYFR10SXXXJ	CORNING	-S.A.T- 10,12,15-500V,±.25PF,±5%	C8		99
2	CYFR10S510J	CORNING	-51PF,500V,±5%	C9,C16		100
1	M39014/01-1587	MIL-C-39014/1	-.047UF,50V,±10%	C10		101
1	CYFR10SXXXJ	CORNING	-S.A.T-20PF, 47,500V,±5%	C12		102
1	CYFR10S121J	CORNING	-120.PF,500V,±5%	C13.		103
4	M39014/01-1593	MIL-C-39014/1	-.1UF,50V,±10%	C15,17, 25,27		104
						105
1	M39014/01-1593	MIL-C-39014/1	0.1UF50V±10%	C29		106
						107
						108
2	M39014/01-1563	MIL-C-39014/1	-2200PF,100V,±10%	C21,31		109
2	M39014/01-1339	MIL-C-39014/1	-100PF,200V,±10%	C23,33		110
1	CYFR10S240J	CORNING	-24PF,500V,±5%	C26		111
1	CYFR10S470J	CORNING	-47 PF,500V±5%	C14		112
3	CYFR10S111J	CORNING	-110 PF,500V±5%	C20,C44, C45		113
						114
2	M39006/22-0577	MIL-C-39006/22	CAPACITOR-82UF,50V±10%	C35,36		115
						116
2	M39003/01-3088	MIL-C-39003/1	CAPACITOR-4.7UF,50V±10%	C42,43		117
						118

TITLE	SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
PARTS LIST-R.F. SUPPLY, VHM	A	13126	PL200053	B

SCALE - RELEASED SHEET 9 OF 9

Ball Aerospace Systems Division — Western Laboratories

-4-5-A (1-78)

ENGINEERING ORDER

DIST CODE 010-A RELEASED DEC 03 '80

DRAWING TITLE	JOB NO.	CODE IDENT NO.	
PARTS LIST RF SUPPLY VHM — PL 200053	2920	13126	EO — PL200053-B-1

TYPE OF EO	DISPOSITION OF PARTS			
☑ CHANGE	☑ USE	ORIG — DATE 12-2-80	NEXT ASSY 200036	EFFECTIVITY 1 & UP
☐ VARIANCE	☐ REWORK	CHECK — 12-3-80	MODEL NO. 200036	
☐ SUPERSEDING	☐ SCRAP	ENGR — 12-3-80		
☐ NOTED	☒ NOTED BELOW	PM	OTHER DWG AFFECTED —	ECP
		APPR		
		CUSTOMER		SHT 1 OF 1

DESCRIBE CHANGE AND GIVE REASON:

1. ITEM 62 PAGE 7

WAS 3 QTY, 260-4TH5E, INSULATED HEATSINK, Q3, Q5, Q6.

IS 4 QTY, 260-4TH5B, INSULATED HEATSINK, Q2, Q3, Q5, Q6.

REASON FOR ABOVE: REQUIRED DESIGN ENGINEERING CHANGES.

PART NO.	SPECIFICATION	DESCRIPTION

Ball Aerospace Systems Division — Western Laboratories

W L-4-,-A (1-7..)

ENGINEERING ORDER

DIST CODE 010 A

RELEASED FEB 13 '81

DRAWING TITLE	JOB NO.	CODE IDENT NO.	
PARTS LIST R.F. SUPPLY VHM	2920	13126	EO — PL 200053 REV B B-2

TYPE OF EO	DISPOSITION OF PARTS			
[X] CHANGE	[X] USE	ORIG Jaramillo DATE 2-12-81	NEXT ASSY 200053	EFFECTIVITY 1 & UP
[ ] VARIANCE	[ ] REWORK	CHECK	MODEL NO. 200036-01	
[ ] SUPERSEDING	[ ] SCRAP	ENGR		
[ ] NOTED	[X] NOTED BELOW	PM [signature] 2-16-81	OTHER DWG AFFECTED SCH 200053	ECP
		APPR [signature]		SHT 1 OF 2
		CUSTOMER		

DESCRIBE CHANGE AND GIVE REASON:

1) PAGE 7, ITEM 62

WAS

3 260-4TH5E INSULATED HEAT SINK FOR Q3, 5, 6

IS

4 260-4TH5B INSULATED HEAT SINK FOR Q2, Q3, 5, 6

2.) PAGE 8, ITEM 76

WAS

DESCRIP.

2.7pf, 6.8pf, 10pf, 500v

IS

DESCRIP.

2.2pf, 6.8pf, 10pf, 500v

3) PAGE 8, ITEM 81

WAS

DESCRIP

0pf, 2.7pf, 6.8pf, 10pf 500v

IS

DESCRIP.

0pf, 2.2pf, 6.8pf, 10pf, 500v

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QTY REQD PER NOTED ASSY	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	ZONE	ITEM NO

Ball Brothers Research Corporation

WAE-4-3-B (1-76)

ENGINEERING ORDER

DIST CODE ____ RELEASED ____

DRAWING TITLE	JOB NO.	CODE IDENT NO.	
PARTS LIST R.F. SUPPLY YHM	2920	13126	EO — PL200053 REV B.

SHT 2 OF 2

4.) PAGE 8, ITEM 86
ADD TO DESCRIPTION:
0 pf

5) PAGE 8, ITEM 82
ADD TO DESCRIPTION:
47 pf

6) PAGE 9, ITEM 94

WAS — SPECIFICATION
1250-003

IS — SPECIFICATION
51-712-04
(MIL-15733/28-0001)

Vought Aerospace Systems Division — Western Laboratories

W L-4-5-A (1-78)

ENGINEERING ORDER

DIST CODE 010A RELEASED APR 03 '81

DRAWING TITLE	JOB NO.	CODE IDENT NO.	EO
PARTS LIST RF SUPPLY VHM	2920	13126	B-3 — PL200053 REV. B

TYPE OF EO	DISPOSITION OF PARTS			
[X] CHANGE	[ ] USE	ORIG JARAMILLO DATE 4-2-81	NEXT ASSY 200053	EFFECTIVITY
[ ] VARIANCE	[X] REWORK	CHECK	MODEL NO. 200036-01	1 & UP
[ ] SUPERSEDING	[ ] SCRAP	ENGR		
[ ] NOTED	[ ] NOTED BELOW	PM [signature]	OTHER DWG AFFECTED SCH200053	ECP
		APPR [signature] 4/3/81		
		CUSTOMER WPBJ 4-2-81		SHT 1 OF 1

DESCRIBE CHANGE AND GIVE REASON:

1.) SHEET 9, ITEM 106

WAS

1 M39014/01-1593 0.1uf/50v ± 10% C29

IS

3 M39014/01-1593 0.1uf/50v ± 10% C29, C52, C53

2.) SHEET 9, ITEM 114

ADD

1 CYFR15S561J CORNING 560pf ± 5% C51

QTY REQ'D					NEXT ASSY	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES		ZONE	ITEM NO.

W L-4-5-A (1-78)

Aerospace Systems Division — Western Laboratories

ENGINEERING ORDER

UNIT CODE A 010 — RELEASED APR 14 '81

DRAWING TITLE	JOB NO.	CODE IDENT NO.	
PARTS LIST RF SUPPLY VHM	2920	13126	B-4 EO — PL 200053 REV B

TYPE OF EO	DISPOSITION OF PARTS			
[X] CHANGE	[X] USE	ORIG JARAMILLO DATE 4/10/81	NEXT ASSY 200053	EFFECTIVITY 1 & UP
[ ] VARIANCE	[ ] REWORK	CHECK RJ	MODEL NO. 200036-01	
[ ] SUPERSEDING	[ ] SCRAP	ENGR W. Leshin		
[ ] NOTED	[ ] NOTED BELOW	PM Dean D. Aalani	OTHER DWG AFFECTED SCH 200053	ECP
		APPR [signature] QA 4/13/81		
		CUSTOMER WPBJ 4-13-81		SHT 1 OF 1

DESCRIBE CHANGE AND GIVE REASON:

1.) SHEET 9, ITEM 114

WAS

1	CYFR15S561J	CORNING	560pf ± 10%	C51

IS

2	CYFR15S561J	CORNING	560pf ± 10%	C51, C54

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Aerospace Systems Division — Western Laboratories

W L-4-5-A (1-78)

ENGINEERING ORDER

DIST CODE 010A   RELEASED [illegible]

DRAWING TITLE	JOB NO.	CODE IDENT NO.	EO
PARTS LIST — R.F. SUPPLY VHM	2920	13126	EO — PL200053 B-5

TYPE OF EO	DISPOSITION OF PARTS				
☒ CHANGE	☐ USE	ORIG [illegible]	DATE 23 [illegible]	NEXT ASSY 200053	EFFECTIVITY SN-1 & UP B-5
☐ VARIANCE	☒ REWORK	CHECK [illegible]	4-23-81	MODEL NO.	
☐ SUPERSEDING	☐ SCRAP	ENGR [illegible]	4-23-81		
☐ NOTED	☐ NOTED BELOW	PM [illegible]	4-23-80	OTHER DWG AFFECTED SCH200053 200243	ECP
		APPR [illegible]	4-24-81		
		CUSTOMER [illegible]	4-24-81		SHT 1 OF 1

DESCRIBE CHANGE AND GIVE REASON: ENGR CHANGE

1. ITEM #7 PART No. WAS: 200243-2
IS: 200243-3

DESCRIPTION WAS: CHOKE, SAT 0.1UH TO 0.8UH
IS: CHOKE, SAT 0.1UH TO 3UH

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QTY	ER NOTED ASSY	PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	CODE	ZONE	ITEM NO.

W L-4-5-A (1-78)

Aerospace Systems Division — Western Laboratories

ENGINEERING ORDER

DIST CODE 010A RELEASED

DRAWING TITLE	JOB NO.	CODE IDENT NO.	EO
PARTS LIST RF SUPPLY, VHM	2920	13126	EO — PLZ 00053 B-6

TYPE OF EO	DISPOSITION OF PARTS			
☒ CHANGE	☐ USE	ORIG G. G. DATE 6/5/81	NEXT ASSY 200057	EFFECTIVITY SN 1 & UP
☐ VARIANCE	☐ REWORK	CHECK	MODEL NO.	
☐ SUPERSEDING	☐ SCRAP	ENGR W CASHIN 6/4/81	OTHER DWG AFFECTED SCH 200053	ECP
☐ NOTED	☐ NOTED BELOW	PM D. A. L. 6/18/81		SHT 1 OF 2
		APPR 6-11-81		
		CUSTOMER W P B J 6-15-81		

DESCRIBE CHANGE AND GIVE REASON:

ITEM 44 WAS: QUANTITY: 2 S.A.T. — 3.65K, 3.92K, 4.22K, 4.53K, 4.87K, 5.11K R11, R20

IS: QUANTITY: 1 S.A.T. — 4.22K, 4.32K, 4.42K, 4.53K, 4.64K, 4.75K, 4.87K, 4.99K, 5.11K, 5.23K, 5.36K, 5.49K, 5.62K, 5.76K, 5.90K, 6.04K, 6.19K, 6.34K, 6.49K, 6.65K, 6.81K, 6.98K, 7.15K, 7.32K, 7.50K, 7.68K, 7.87K, 8.06K, 8.25K, 8.45K, 8.66K, 8.87K, 9.09K R11

ITEM 49 ADD: QUANTITY: 1 RNC55HXXXXFS

S.A.T. — 1.74K, 1.78K, 1.82K, 1.87K, 1.91K, 1.96K, 2.00K, 2.05K, 2.10K, 2.15K, 2.21K, 2.26K, 2.32K, 2.37K, 2.43K, 2.49K, 2.55K, 2.61K, 2.67K, 2.74K, 2.80K, 2.87K, 2.94K, 3.01K, 3.09K, 3.16K, 3.24K, 3.32K, 3.40K, 3.48K, 3.57K, 3.65K, 3.74K, 3.83K, 3.92K, 4.02K, 4.12K R20

PART NO.	SPECIFICATION	DESCRIPTION	ELECT REF DES	CODE	ZONE	ITEM NO.

W L-4-5-A (1-78)

Aerospace Systems Division — Western Laboratories

ENGINEERING ORDER

DIST CODE 010A RELEASED JUN 16 1981

DRAWING TITLE	JOB NO.	CODE IDENT NO.	
PARTS LIST RF SUPPLY, VHM	2920	13126	EO — PL200053B6

TYPE OF EO	DISPOSITION OF PARTS			
☒ CHANGE	☐ USE	ORIG G.G. DATE 6/9/81	NEXT ASSY 200057	EFFECTIVITY SN 1 & UP
☐ VARIANCE	☐ REWORK	CHECK	MODEL NO.	
☐ SUPERSEDING	☐ SCRAP	ENGR W CASHION 6/9/81		
☐ NOTED	☐ NOTED BELOW	PM 6/10/81	OTHER DWG AFFECTED SCH200053	ECP
		APPR 6-11-81		
		CUSTOMER 6-15-81		SHT 2 OF 2

DESCRIBE CHANGE AND GIVE REASON:

ITEM 76 WAS: C30, C49 quantity: 2
IS: C49 quantity: 1

ITEM 77 WAS: 0pf, 15pf, 20pf, 24pf, 27pf, 30pf, 33pf, 36pf, 160pf, 200pf, 240pf, 500V quantity: 2 C30, C49
IS: 0pf, 15pf, 20pf, 24pf, 27pf, 30pf, 33pf, 36pf, 500V quantity: 1 C49

ITEM 78 WAS: 270pf, 300pf quantity: 2 C30, C49
IS: 270pf quantity: 1 C30

ITEM 90 ADD: CAPACITOR, SAT. ±5% CYFR10SXXXJ 82pf, 120pf, 160pf, 200pf, 240pf, 500V quantity: 1 C30

ITEM 81 WAS: QUANTITY: 2 C28, C46
IS: QUANTITY: 1 C28

ITEM 82 WAS: QUANTITY: 2 C28, C46 15pf, 20pf, 68pf, 500V
IS: QUANTITY: 1 C28 15pf, 500V

ITEM 91 ADD: QUANTITY: 1 CYFR10SXXXJ CAPACITOR SAT ±5% 0pf, 20pf, 500V C46

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Ball Aerospace Systems Division — Western Laboratories

DIST CODE	PARTS LIST NO.	REV
010A	PL 200359	

REVISIONS

EFF	REV	DESCRIPTION	BY	CK	DATE	APPD

MAR 1 0 1982

9. S.A.T. - 1.74K, 1.78K, 1.82K, 1.87K, 1.91K, 1.96K, 2.00K, 2.05K, 2.10K, 2.15K, 2.21K, 2.26K, 2.32K, 2.37K, 2.43K, 2.49K, 2.55K, 2.61K, 2.67K, 2.74K, 2.80K, 2.87K, 2.94K, 3.01K, 3.09K, 3.16K, 3.24K, 3.32K, 3.40K, 3.48K, 3.57K, 3.65K, 3.74K, 3.83K, 3.92K, 4.02K, 4.12K
8. S.A.T. - 4.22K, 4.32K, 4.42K, 4.53K, 4.64K, 4.75K, 4.87K, 4.99K, 5.11K, 5.23K, 5.36K, 5.49K, 5.62K, 5.76K, 5.90K, 6.04K, 6.19K, 6.34K, 6.49K, 6.65K, 6.81K, 6.98K, 7.15K, 7.32K, 7.50K, 7.68K, 7.87K, 8.06K, 8.25K, 8.45K, 8.66K, 8.87K, 9.09K
7. PRE-SELECT FOR BV_{CBO} > 60 V
6. PRE-SELECT FOR 2.2 mH TO 2.4 mH.
5. PRE-SELECT FOR BV_{CBO} > 22V.
4. PRE-SELECT FOR F_T > 500 MHZ, HFE > 18.5 AT IC=160 MA ± 10 MA; BV_{CBO} > 60V.
3. PRE-SELECT FOR HFE > 150 AT IC= 80 MA ± 5 MA.
2. PRE-SELECT FOR HFE > 150 AT IC= 160 MA ± 10 MA.
1. ALL JPL SPECIFICATIONS WILL BE IDENTIFIED BY "PT" OR "ST" SERIES DESIGNATORS.

NOTES: UNLESS OTHERWISE SPECIFIED

APPLICATION	CONTRACT NO.		TITLE
NEXT ASSY	DRAWN Gaucher	5/14/81	PARTS LIST
200357-02	CHECK WPBJ	6-5-81	PRINTED WIRING BD ASSY
	MECH ENGR		RF
	ELECT ENGR		
FINAL ASSY	PROJ MGR		
200348-01	APPD Herbert Yamane	6-1-81	SIZE A · CODE IDENT NO. 13126 · PARTS LIST NO. PL 200359 · REV
	DESIGN ACTIVITY APPD WPBJ	6-15-81	
	CUSTOMER		SCALE — · RELEASED JUN 16 1981 · SHEET 1 OF 6

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QTY REQD		-01	PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
		1	200360-11		PRINTED WIRING BD			1
		1	200361-11		HEATSINK, Q1			2
		4	200362-11		HEATSINK, Q2, Q3, Q5, Q6			3
		1	1025-28	DELEVAN	CHOKE, 2.2 UH ± 10%	L8	6	4
			200243-2	S200243	CHOKE, SAT 0.1 UH TO 0.8 UH	L5		5
								6
		1	200243-3	S200243	CHOKE, SAT 0.1 UH TO 3 UH	L12		7
		2	200243-1	S200243	CHOKE, .30 UH ± 2%	L15, L16		8
								9
		2	1537-36	DELEVAN	CHOKE, 10 UH, ± 10%	L1, L14		10
		1	1025-16	DELEVAN	CHOKE, .68 UH ± 10%	L3		11
		5	1025-52	DELEVAN	CHOKE, 22 UH ± 10%	L4, L6, L7 L10, L11		12
		2	1025-44	DELEVAN	CHOKE, 10 UH ± 10%	L9, L13		13
								14
		1	JANTXV 2N2219A	ST11892	TRANSISTOR, NPN	Q6	7	15
		1	JANTXV 2N918	ST11788	TRANSISTOR, NPN	Q1	5	16
		1	JANTXV 2N2219A	ST11892	TRANSISTOR, NPN	Q2		17
		1	JANTXV 2N2905A	ST11890	TRANSISTOR, PNP	Q3	2	18
		1	JANTXV 2N3375	MIL-S-19500/341	TRANSISTOR, NPN	Q4	4	19
		1	JANTXV 2N2219A	ST11872	TRANSISTOR, NPN	Q7		20
		1	JANTXV 2N2905A	ST11890	TRANSISTOR, PNP	Q5	3	21
								22
		2	ST11499-723H	ST11499	VOLTAGE REG (LM723H)	AR1, AR3		23
		2	ST11499-108AFBR	ST11499	OP AMPL (LM108AF)	AR2, AR4		24
								25

TITLE:	SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
PARTS LIST P.W. BD ASSY SF	A	13126	PL 200359	
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QTY REQD			PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
		-01						
		2	JANTXV1N4100	MIL-S-19500/435	DIODE ZENER, 7.5V	CR1, CR5		26
		2	JANTXV1N4623	PT 40434	DIODE ZENER, 4.3V	CR2 CR6		27
		4	JANTXV1N4148	PT 40015	DIODE SWITCHING	CR3, CR4 CR7, CR8		28
								29
								30
								31
		1	43602-1	S 43602	CRYSTAL, 27 MHZ	FL1		32
								33
								34
		1	RNC55H 6811FS	ST11548 OR MIL-R-55182/1	RESISTOR, 6.81K, ±1%, $\frac{1}{10}$ W	R1		35
		1	1502FS		15 K	R2		36
		1	6810FS		681 Ω	R3		37
		4	1002FS		10K	R4, R12, R21, R22		38
		1	4751FS		4.75K	R5		39
		1	XXXXFS		9	R20		40
		2	2000FS		200 Ω	R7, R25		41
		4	1001FS		1K	R8, R9, R15, R23		42
		2	3011FS		3.01K	R10, R19		43
		1	XXXXFS		8	R11		44
		1	5621FS		5.62K	R13		45
		1	6191FS		6.19K	R14		46
		1	3920FS		392 Ω	R16		47
		2	RNC55H 2001FS	ST11548 OR MIL-R-55182/1	2K $\frac{1}{10}$ W	R17, R18		48
		1	RWR81S 82R5FS		RESISTOR, 82.5Ω, ±1%, 1W	R6		49
								50

TITLE:	SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
PARTS LIST PW BD ASSY RF	A	13126	PL 200359	

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QTY REQD		-01	PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
		2	10122-DAP	MILTON ROSS	TRANSIPAD (TO-5)	FOR: FL1, Q7		51
		1	10018-DAP	MILTON ROSS	TRANSIPAD (TO-18)	FOR: Q1		52
		2	10247-DAP	MILTON ROSS	TRANSIPAD TO-100	FOR: AR1, AR3		53
		AR	50000 SERIES	WORNOW	CAT-L-INK, EPOXY, BLK			54
		AR	50000 SERIES	PROCESS PAINT CO	CATALYST, NO. 9			55
		AR	C113-300	S43028	SOLITHANE			56
		AR	0151	S43024	EPOXY PATCH (HYSOL)			57
		AR	SN63 WRAP2	QQ-S-571	SOLDER			58
		AR	ABLEFILM 517	ABLESTIK	TAPE ADHESIVE			59
		1	MS24693-C1		SCREW, FLT HD, CRES, 100°	4-40 X 3/16 LG		60
		10	MS51957-2		SCREW PAN HD CRES 2-56	x 3/16 LG		61
		4	260-4THS B	WAKEFIELD	HEAT SINK, INSULATED	FOR: Q2, Q3, Q5, Q6		62
		1	MS35338-138		WASHER, LOCK, CRES, #10			63
								64
		REF		S40111	SPEC, IDENTIFICATION			65
		REF		S43024	SPEC, BONDING			66
		REF		S43028	SPEC, CONF. COAT			67
		REF	NHB5300.4(3A-1)		SPEC, SOLDER			68
		REF	SCH200053		SCHEMATIC			69
		AR	TYPE S	QQ-W-343	WIRE, BUS, 26 AWG			70
		AR	AMS3654-22		TUBING INSULATION			71
		AR	32001	ASTROLAB	WIRE SHIELDED 26AWG			72
		10	MS35338-134		WASHER, LOCK, CRES, #2			73
		1	NAS671C10		NUT, HEX, CRES, #10-32			74
		10	NAS620C2L		WASHER, FLAT, CRES, #2			75

TITLE:	SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
PARTS LIST PW. BD ASSY [illegible] F	A	13126	PL 200359	
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QTY REQD		-01	PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
		1	CYFR10SXXXC	CORNING	CAPACITOR, SAT, ±.25PF	C49		76
					0PF 2.2PF, 2.7PF, 6.8PF, 10 PF, 500 V			
		1	CYFR10SXXXJ	CORNING	CAPACITOR, SAT, ±5%	C49		77
					0 PF, 15 PF, 20 PF, 24 PF, 27PF, 30PF, 33PF, 36 PF, 500V			
		1	CYFR10SXXXJ	CORNING	CAPACITOR, SAT, ±5%	C30		78
					82PF, 120 PF, 160 PF, 200PF, 240 PF, 500V			
		1	CYFR15SXXXJ	CORNING	CAPACITOR, SAT, ±5%	C30		79
					270 PF 500V			
		2	JMCR5342	JOHANSON	CAPACITOR VARIABLE .6 PF – 10PF	C19, C48		80
		1	CYFR10SXXXC	CORNING	CAPACITOR, SAT, ±.25PF	C28		81
					0PF, 2.2PF, 2.7 PF, 6.8 PF, 10 PF, 500V			
		1	CYFR10SXXXJ	CORNING	CAPACITOR, SAT, ±5%	C28		82
					15 PF, 500V			
								83
		1	CYFR10SXXXC	CORNING	CAPACITOR, SAT, ±.25PF	C18		84
					2.7 PF, 6.8PF, 10PF, 500V			
		1	CYFR10SXXXJ	CORNING	CAPACITOR, SAT, ±5%	C18		85
					12 PF, 15 PF, 16 PF, 18PF, 20 PF, 500V			
		1	CYFR10SXXXJ	CORNING	CAPACITOR, SAT, ±5%	C47		86
					0PF, 10PF, 18PF, 27PF, 500V			
								87
		1	CYFR10SXXXJ	CORNING	CAPACITOR, SAT, ±5%	C50		88
					0PF, 10PF, 18 PF, 500V			
								89
								90

TITLE:	SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
PARTS LIST P.W. BD ASSY RF	A	13126	PL 200359	
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QTY REQD		-C1	PART NO.	SPECIFICATION	DESCRIPTION	ELEC REF DES	CODE IDENT	ITEM NO.
		1	CYFR10SXXXJ	CORNING	CAPACITOR, SAT, ±5%	C46		91
					0 PF, 20 PF, 500V			
								92
								93
								94
		3	M39014/01-1569	MIL-C-39014/1	CAPACITOR 4700 PF ±10% 100 V	C3, C7, C11		95
		3	M39014/01-1351	MIL-C-39014/1	470PF ±10% 200V	C4, C22, C32		96
		1	CYFR10S8R2C	CORNING	8.2PF ±.25PF 500V	C5		97
		1	CYFR10S300J	CORNING	30 PF ±5%, 500V	C6		98
		1	CYFR10SXXXJ	CORNING	SAT ±.25PF 10PF, 12PF, 15PF, 500V	C8		99
		2	CYFR10S510J	CORNING	51PF ±5%, 500V	C9, C16		100
		1	M39014/01-1527	MIL-C-39014/1	.047µF ±10% 50V	C10		101
		1	CYFR10SXXXJ	CORNING	SAT ±5% 20PF, 47PF 500V	C12		102
		1	CYFR10S121J	CORNING	120PF ±5%, 500V	C13		103
		7	M39014/01-1593	MIL-C-39014/1	0.1µF, ±10%, 50V	C15, C17, C29, C25, C27, C52, C53		104
		2	M39014/01-1563	MIL-C-39014/1	2200 PF ±10%, 100V	C21, C31		105
		2	M39014/01-1339	MIL-C-39014/1	100 PF ±10%, 200V	C23, C33		106
		1	CYFR10S240J	CORNING	24 PF ±5%, 500V	C26		107
		1	CYFR10S470J	CORNING	47 PF ±5%, 500V	C14		108
		3	CYFR10S111J	CORNING	110PF ±5%, 500V	C20, C44, C45		109
		2	CYFR15S561J	CORNING	560 PF ±5%, 500V	C51, C54		110
		2	M39006/22-0577	MIL-C-39006/22	82 µF ±10%, 50V	C35, C36		111
		2	M39003/01-3088	MIL-C-39003/1	CAPACITOR, 4.7µF ±10%, 50V	C42, C43		112
								113
								114

TITLE:	SIZE	CODE IDENT NO.	PARTS LIST NO.	REV
PARTS LIST PW BD ASSY RF	A	13126	PL 200359	
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Aerospace Systems Division
Western Laboratories

ENGINEERING ORDER

W L-4-5-A (1-78)

DIST CODE 010A RELEASED DEC 0 9 1981

DRAWING TITLE	JOB NO.	CODE IDENT NO.	
PARTS LIST PRINTED WIRING BOARD ASSY, RF	2920	13126	EO — PL200359NC-1

TYPE OF EO	DISPOSITION OF PARTS				
☒ CHANGE	☐ USE	ORIG GAUGHEN DATE 12/8/81	NEXT ASSY 200057-02	EFFECTIVITY SN 1 & UP
☐ VARIANCE	☒ REWORK	CHECK PBJ 12-8-81	MODEL NO.	
☐ SUPERSEDING	☐ SCRAP	ELEN [illegible] 12-9-81		
☐ NOTED	☐ NOTED BELOW	FU [illegible] 12-9-81	OTHER DWG AFFECTED 200359	ECP
		APPR [illegible] 12/9/81		
		CUSTOMER PBJ 12-8-81		SHT 1 OF 1

DESCRIBE CHANGE AND GIVE REASON: STRANDED WIRE NEEDED TO ADAPT TO LEADS OF C35 & C36 TO MEET STRESS REQUIREMENT

ADD ITEM 64

AR,	26 AWG TYPE E	MIL-W-16878/4	WIRE, INSULATED, TEFLON, WHITE			64

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					PART NO.	SPECIFICATION	DESCRIPTION	[illegible]	CODE	[illegible]

SECTION 9

TEST SPECIFICATION - SYSTEM INTEGRATION (VHM)

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Ball Aerospace Systems Division Western Laboratories	DIST CODE 010A	SPECIFICATION NO. S 200036	A

REVISIONS

EFF	REV	DESCRIPTION	BY	CK	DATE	APPD
1 & up	A	General Revision	RJ		6-17-81	D.A.

APPLICATION	CONTRACT NO. 955481		TITLE
NEXT ASSY	DRAWN R. Jaramillo	4/81	TEST SPECIFICATION - SYSTEM INTEGRATION TEST ISPM/VHM
	CHECK R. Jaramillo	4/20/81	
	MECH ENGR		
	ELECT ENGR		
FINAL ASSY	PROJ MGR		SIZE A · CODE IDENT NO. 13126 · SPECIFICATION NO. S 200036 · A
	APPD	4/21/81	
	DESIGN ACTIVITY APPD W.B.J.	4-21-81	
	CUSTOMER		SCALE · RELEASED · SHEET 1 OF 00

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1.0 SCOPE

This specification covers the electrical checkout of assembly number 200036-01, Vector Helium Magnetometer.

This test specification defines the test requirements for the initial system integration test. The system integration test shall be performed in conjunction with JPL. The testing shall require usage of BASD/WL facilities and JPL test facilities.

The test outline, as noted in this test specification, is intended as a guide and can be modified as required to ensure satisfaction of the electrical requirements. If this procedure is modified, a red-lined copy of the actual procedure should be attached to the appropriate assembly plan/test results. This procedure requires extensive selection of components. The instructions to perform such tasks should be documented in the test unit assembly plan/unit history. All test data must be attached to the assembly plan/unit history.

2.0 APPLICABLE DOCUMENTS

2.1 The following documents, of the issue and revision in effect on the date of invitation for bids, form a part of this specification to the extent specified herein.

DRAWINGS

Ball Aerospace Systems Division, Western Laboratories (BASD/WL)

200061	Assembly Drawing, Digital
PL200061	Parts List
SCH200061	Schematic
200059	Assembly Drawing, Analog

PL200059	Parts List
SCH200059	Schematic
200050	Assembly Drawing, LVPS
PL200050	Parts List
SCH200050	Schematic
200053	Assembly Drawing, RF
PL200053	Parts List
SCH200053	Schematic
200222	Test Plan

OTHER DOCUMENTS

1628-11, Rev. A	Functional Requirements for the Vector Helium Magnetometer (VHM)

2.2 Precedence of Governing Documents

Unless otherwise specified, when a requirement of an applicable specification is in conflict with a requirement specified herein, the requirement specified herein shall apply. When a requirement of an applicable drawing is in conflict with a requirement specified herein, the requirement specified on the drawing shall apply.

3.0 REQUIREMENTS

3.1 Acceptable results are contingent upon the use of the equipment and test procedures as specified herein. The test shall be performed in the exact order specified herein.

3.2 Standard Test Equipment

The following standard test equipment, or equivalent, shall be used to check out the assembly:

Quantity	Description	Manufacturer	Model No.
3	Power Supply	Power Design	5005R
1	Frequency Counter	CMC	607A
1	Oscillator	H.P.	3300A
1	Breakout Box	TAL	805
1	Oscilloscope	Tektronix	465
1	Recorder	Gulton	TR-444
1	DVM	Fluke	8100A
2	Decade Resistor	Gen. Radio	1432-Z
1	VOM	Tripplett	630-NA
A/R	Breakout Box	TAL	--
1	Distortion Analyzer	TBD	TBD

3.3 Special Test Equipment

Quantity	Description	Manufacturer	Model No.
1	BCE	JPL	--
1 set	Test Cables	BASD/WL	--
1	Flux Tank	BASD/WL	136-1
1	Temperature Chamber	SES	TK/5
1	Flux Tank Ctrl Unit	BASD/WL	318-1

3.4 Test Set-Up

See Figure 1 for test set-up.

3.5 Use of BASD/WL Form WL 4-8A

The assembly tester shall use the assembly test data sheet, WL Form 4-8A, as follows:

A. The tester shall fill in the test specification, revision letter, date of test, assembly serial number and the type of test (prepot,

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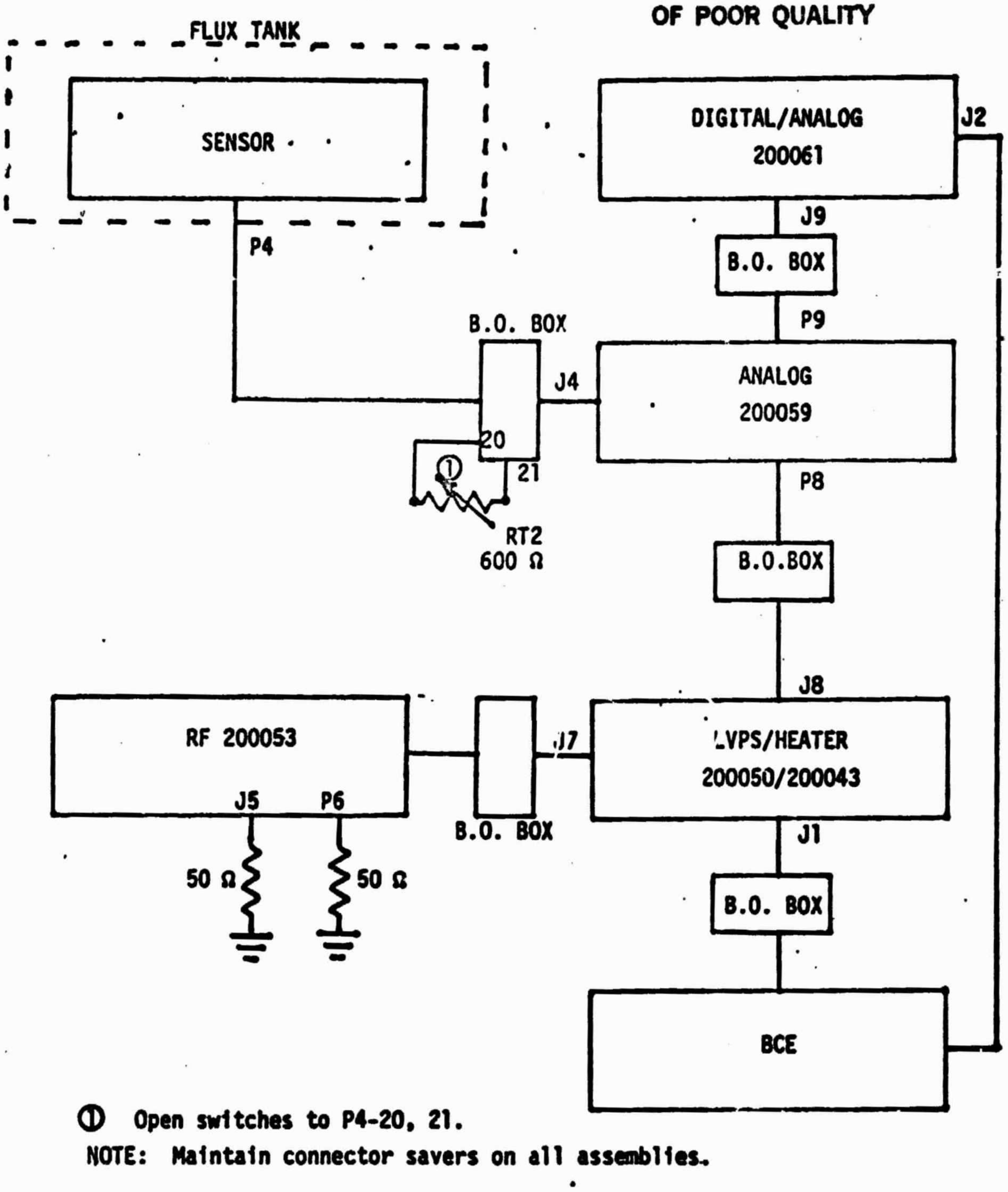


① Open switches to P4-20, 21.

NOTE: Maintain connector savers on all assemblies.

Figure 1. Test Set-Up

Ball Aerospace Systems Division Western Laboratories	CODE IDENT NO. 13126	SPECIFICATION NUMBER S 200036	REV A
		SHEET 5 OF	

post-pot, etc.), in the appropriate blanks. Each sheet shall contain all of the information above.

B. After the test procedure outlined in the asterisked paragraph has been performed, the tester shall record the selected component value or the test data, whichever is applicable, in the appropriate blanks. In the event of assembly failure, the tester shall:

1. Briefly state the reasons for failure (if known) under the "Remarks" column of WL Form 4-8A, and the JPL Unit History Log.

2. Notify the cognizant engineer immediately.

C. Upon satisfactory completion of this test, the tester shall sign the data sheet and attach it to the assembly traveler.

3.6 Electrical Test - Initial, Go/No-Go

3.6.1 LVPS/Heater (200050)

3.6.1.1 Set up per Figure 1. Set the BCE controls as follows:

Description	Mode
+28 V Power	OFF
+28 V Heater	OFF
IFC	OFF
Auto IFC	OFF
Manual Range	"1"
Man/Auto Range	"1"
Ignition Inhibit	ON

3.6.1.2 Depress the +28 V (instr.) on the BCE to ON.

*3.6.1.3 Verify the +28 V input current is less than or equal to 175 mA.

*3.6.1.4 Measure and record the following:

Test Point	Output
J7-2 to J7-5 (+12 V_{rf})	+12 V ± 0.1 V
J8-2 to J8-22 (-12 V)	-12 V ± 0.6 V
J8-20 to J8-22 (+12 V)	+12 V ± 0.6 V
J8-26 to J8-22 (-6.3 V)	-6.3 V ± 0.6 V
J8-7 to J8-22 (+6.3 V)	+6.3 V ± 0.6 V
J8-12 to J8-14 (+10 V)	+10 V ± 0.5 V
J9-16 to J9-29 (+3.75 V)	+3.75 V ± 0.1 V
J9-1 to J9-29 (-3.75 V)	-3.75 V ± 0.1 V

*3.6.1.5 Verify an output at U1-1 of 57,344 Hz ± 50 Hz per Figure 2.

3.6.1.6 Set decade resistor (RT2) to 600 ohms. Depress heater power to ON (BCE).

*3.6.1.7 Measure and record an output of 0 ± 0.7 Vdc at J8-1.

*3.6.1.8 Set RT2 to 400 ohms. Verify an output of 4.8 Vdc ± 0.2 Vdc at J8-1.

*3.6.1.9 Using the oscilloscope, verify the following:

J5 Output = 16 V p-p ± 1.0 V; P6 Output = 30 V p-p ± 1.5 V.

3.6.1.10 Depress +28 (instr.) and +28 (heater) to OFF.

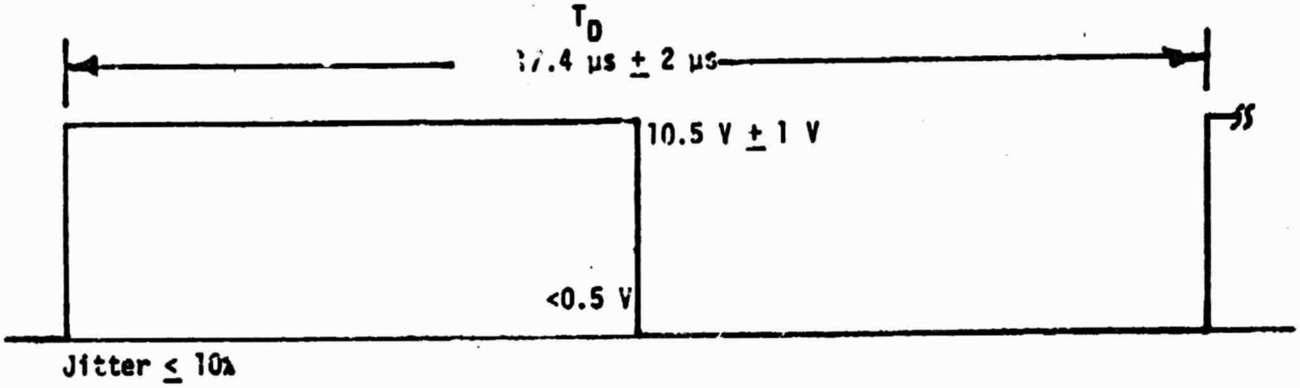


Figure 2. Sync Output

3.6.2 Igniter Circuit/RF

3.6.2.1 Set up per Figure 3. Ensure the sensor is physically located in the center of the flux tank.

3.6.2.2 Connect the oscilloscope to J4-3 (Igniter Return). Use P8-3C as a return for the oscilloscope. Set the HSK switch on the BCE to No. 1. Open switch J9/P9-31. Connect J9-31 to GRD. Set "Ignition Inhibit" on the BCE to OFF.

3.6.2.3 Instrument power ON (on BCE).

*3.6.2.4 Verify an output of 9 V ± 1 V at P9-36 (Ignition ON/OFF).

*3.6.2.5 Continuously depress the "Sun Pulse" switch, and adjust C85, C86 until an output frequency is noted on the oscilloscope per Figure 4. C85, C86 will control frequency. Record data.

*3.6.2.6 Power OFF. Tack solder equivalent value for C85, C86. Record values.

3.6.2.7 Deleted.

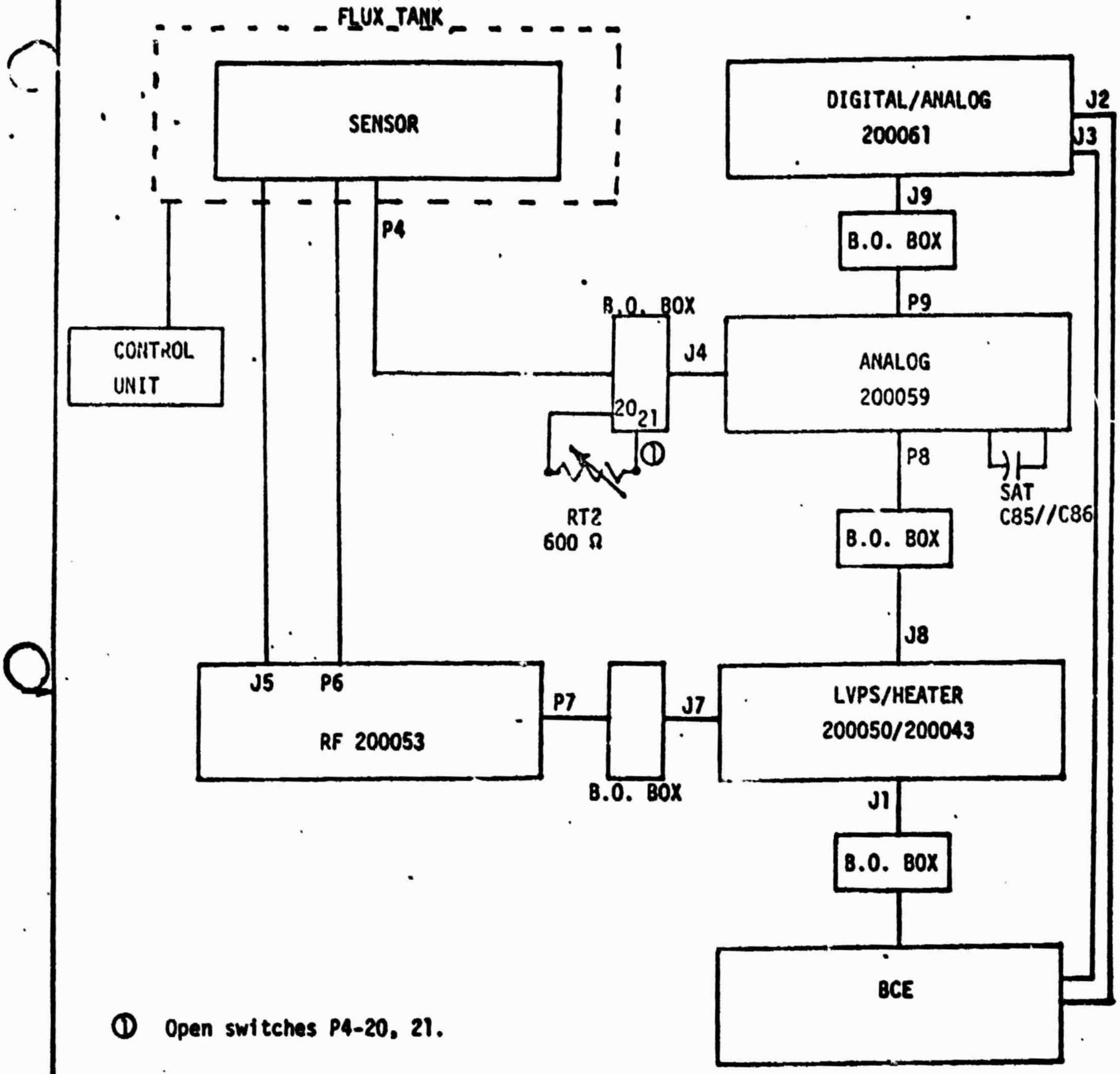
3.6.2.8 Power ON.

*3.6.2.9 Within 60 seconds of power turn ON. Verify an output of 3.8 V ± .25 V on HSK No. 1 (Det. Bias Output) on the BCE.

3.6.2.10 Power OFF. Power ON.

*3.6.2.11 Verify an output on J4-3 per Figure 4. NOTE: It may be necessary to turn power ON/ OFF several times in order to cbserve the output at J4-3.

3.6.2.12 Power OFF.



① Open switches P4-20, 21.

Figure 3. Test Set-Up

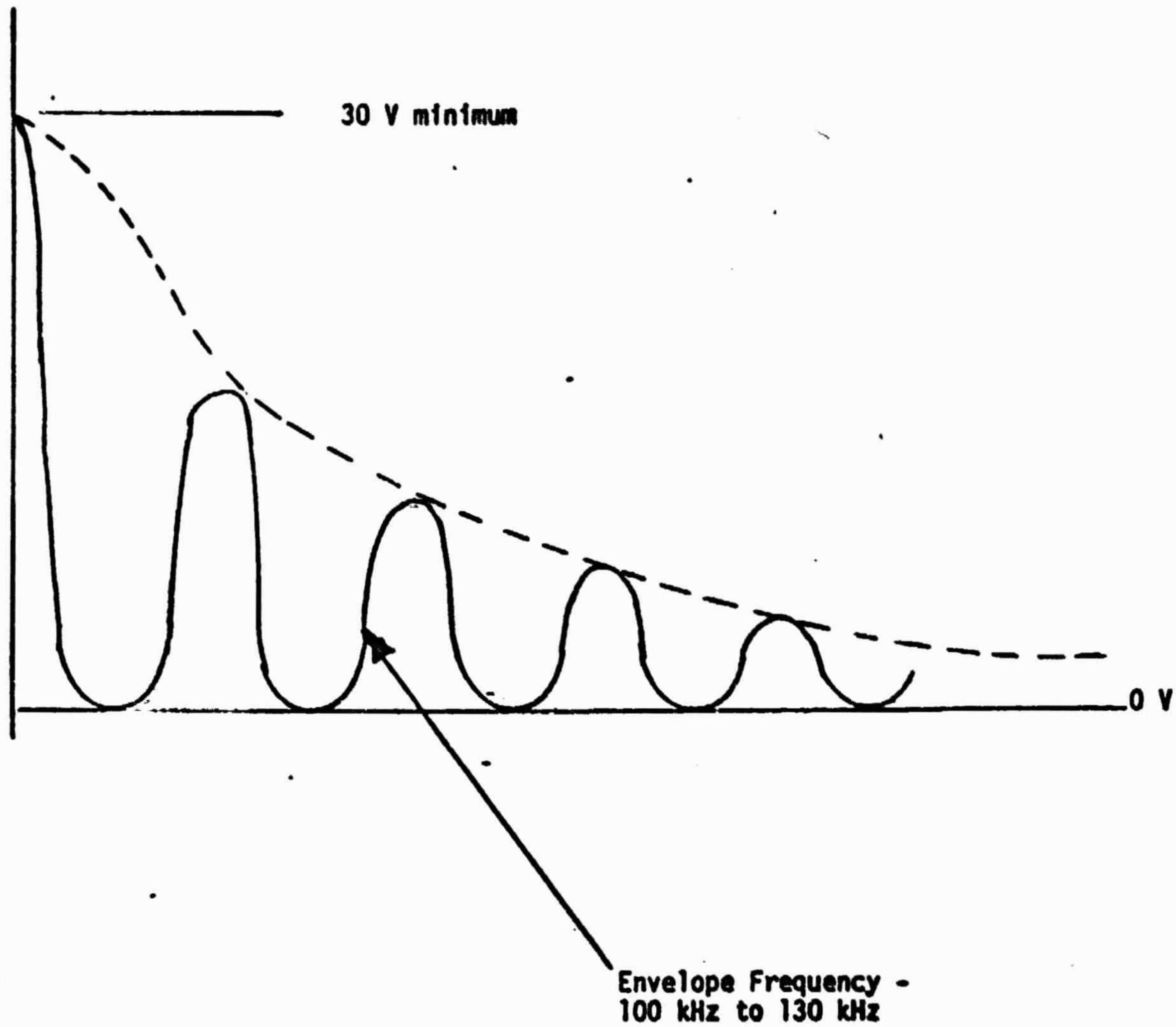


Figure 4. Ignition Pulse

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3.6.3 Servo Amplifier (200059)

3.6.3.1 Ensure the following connections have not been performed (open loop mode):

E11 to E10
E26 to E27
E28 to E29
E24 to E25

3.6.3.2 Set up flux tank per Appendix A.

3.6.3.3 Maintain set-up per Figure 3. Set the BCE as follows:

Description	Mode
+28 V Power	OFF
+28 V Heater	OFF
IFC	OFF
Auto IFC	OFF
Manual Range	"1"
Man/Auto Range	"1"
Ignition Inhibit	OFF
HSK	No. 1

*3.6.3.4 Depress +28 V (instr.) to ON. Verify an +28 V input current of less than 175 mA.

*3.6.3.5 Allow 60 seconds after power turn ON. Verify the following:

Description	Output
HSK No. 1	3.8 V $\pm$ .25 V (BCE)
Signal Status (LED)	ON/OFF (BCE)
Manual Range (LED)	ON (BCE)

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Description	Output
Auto IFC (LED)	OFF (BCE)
CMD IFC (LED)	OFF (BCE)
Over Range (LED)	ON (BCE)
Ing. Status (LED)	OFF/ON (BCE)*
Ing. Switch (LED)	OFF/ON (BCE)*
Oper. Range	ON (BCE)

* Will indicate ON; if 2 fo is not present (preamp OFF).

3.6.3.6 Connect an oscilloscope to AR15-7 (AGC output).

3.6.3.7 While observing the output on AR15-7, adjust the "X", "Y", "Z" null controls on the flux tank until a 2 fo (530 Hz) is noted at AR15-7. (This represents a zero field condition.) NOTE: It may be necessary to periodically adjust the X, Y, Z null controls since the zero field will be influenced by exterior metal objects.

3.6.3.8 Power OFF. Temporarily connect:

E11 to E10
E26 to E27
E28 to E29
E24 to E25

*3.6.3.9 Power ON. Verify outputs on the BCE per 3.6.3.5 and 3.6.3.9 data sheet. Remove the connection to J9-31. Close P9/J9-31.

*3.6.3.10 Verify outputs on "X", "Y", "Z" fields (BCE) are less than or equal to 6.0 V.

*3.6.3.11 Adjust X, Y, Z null controls on the flux tank control until the "X", "Y", "Z" field outputs are less than or equal to 0.1 V. Record the outputs.

*3.6.3.12 Verify an output of 2.0 Vdc ± .3 V on HSK No. 0, and 3.8 V ± .25 V on HSK No. 1.

3.6.3.13 Apply a field of +50 gamma ± 5 gamma.

*3.6.3.14 Verify an output of 3.9 Vdc ± .8 Vdc on "X", "Y", "Z" field outputs.

3.6.3.15 Apply a field of -50 gamma ± 5 gamma.

*3.6.3.16 Verify an output of -3.9 Vdc ± .8 V on "X", "Y", "Z" field outputs.

3.6.3.17 Remove the field in the flux tank.

3.6.3.18 Set Manual Range to "0" (BCE).

*3.6.3.19 Verify Oper. Range (LED) on the BCE is OFF.

*3.6.3.20 Adjust the X, Y, Z null field until an output of less than or equal to 0.5 Vdc is noted on the "X", "Y", "Z" field output. Record the "X", "Y", "Z" outputs.

3.6.3.21 Apply a field of +7.0 gamma ± .7 gamma.

*3.6.3.22 Verify an output of +4.375 V ± .5 V on "X", "Y", "Z" outputs.

3.6.3.23 Apply a field of -7 gamma ± .7 gamma.

*3.6.3.24 Verify an output of -4.375 V ± .5 V on "X", "Y", "Z" outputs.

3.6.3.25 Remove the field in the flux tank.

3.6.3.26 Set "Manual/Auto" on the BCE to "0".

3.6.4 Overrange, Underrange

*3.6.4.1 Verify an output of less than or equal to .5 V on "X", "Y", "Z" field outputs. Null the flux tank field to zero as required. Verify "Oper. Range" LED (BCE) is OFF.

*3.6.4.2 Slowly increase the field to 8.2 gamma in the X direction. Verify "Oper. Range" switches from range 0 (LED OFF) to range 1 (LED ON). The change should occur at 8 gamma ± .2 gamma (5.0 V ± .1 V at the X output).

*3.6.4.3 Verify an output of +.62 V ± .1 V on the "X" output.

*3.6.4.4 While observing the "X" output, slowly reduce the field until the "range" switches from "1" to "0". "Oper. Range" LED should be OFF. The switch point should occur when the "X" output is 0.5 V ± .1 V.

*3.6.4.5 Repeat 3.6.4.2 to 3.6.4.4 for the "Y", "Z" outputs.

3.6.5 IFC

*3.6.5.1 Set the range "0". Set the field to 0 gamma. Verify an output of less than or equal to ± .10 V on the "X", "Y", "Z" outputs.

3.6.5.2 Switch "IFC CMD" on the BCE to ON.

*3.6.5.3 Verify the "X", "Y", "Z" outputs change to -2.5 V ± .25 V, then switch to +2.5 V ± .25 V.

3.6.5.4 Switch "IFC CMD" to OFF. Switch "Range" to "1".

*3.6.5.5 Verify an output of less than or equal to ± .05 V on the "X", "Y", "Z" outputs.

3.6.5.6 Switch the "IFC CMD" to ON.

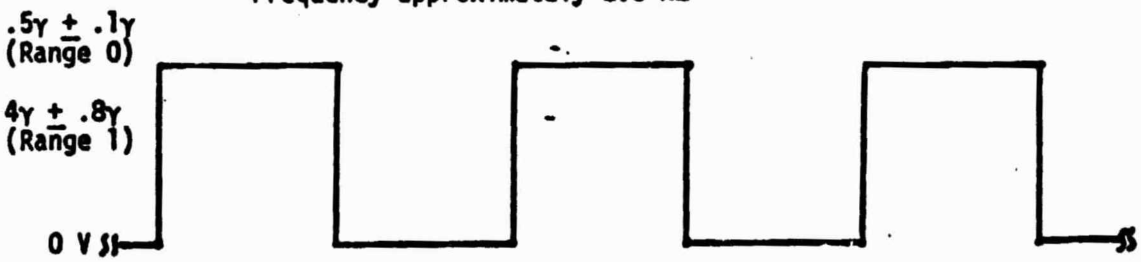
*3.6.5.7 Verify the "X", "Y", "Z" outputs change to -2.5 V ± .25 V, then switch to +2.5 V ± .25 V.

3.6.5.8 Switch the "IFC CMD" to OFF.

3.6.5.9 Connect the output of the "X" field to a chart recorder and calibrate the recorder to 4 gamma = 4 cm.

*3.6.5.10 Turn the recorder ON; switch "Auto IFC" to ON. Verify an output per Figure 5. Attach the recorder printout to the appropriate data sheet. NOTE: Following the completion of a typical "Auto IFC" cycle, it is necessary to switch "Auto IFC" to OFF, then switch to ON to repeat the cycle.

Frequency approximately 2.0 Hz



Fiure 5

*3.6.5.11 Repeat paragraph 3.6.5.10 on the "Y, Z" outputs.

3.6.5.12 Switch to range 0. Calibrate the recorder for 0.5 gamma = 4 cm.

*3.6.5.13 Repeat paragraph 3.6.5.10 and 3.6.5.11.

3.6.5.14 Remove the chart recorder. Switch "Auto IFC" to OFF. Attach the recorder paper to the data sheet.

3.6.6 Housekeeping Outputs

3.6.6.1 Power OFF. Switch to range 1. Set "Ignition Inhibit" to ON. Set RT2 to 600 ohms. Set the field to 50 gamma ± 5 gamma.

3.6.6.2 Turn ON the instrument and heater power.

*3.6.6.3 Verify the following housekeeping outputs:

HSK No.	Output	Output (Unloaded ref. only)
0	0 V ± .1 V	
1	0 V ± .1 V	
2	3.0 V ± .5 V	
3	3.0 V ± .5 V	
4	0 V ± .7 V	
5	2.2 V ± .2 V	2.5 V ± .2 V
6	1.6 V ± .13 V	2.6 V ± .2 V
7	1.6 V ± .13 V	2.6 V ± .2 V

3.6.6.4 Switch "Ignition Inhibit" to OFF. Set RT2 to 400 ohms.

*3.6.6.5 Verify the following HSK outputs:

HSK No.	Output	Output (Unloaded ref. only)
0	2.0 V ± .3 V	
1	3.8 V ± .25 V	
2	3.0 V ± .5 V	
3	3.0 V ± .5 V	
4	4.8 V ± .2 V	
5	2.2 V ± .2 V	2.5 V ± .2 V
6	1.6 V ± .13 V	2.6 V ± .2 V
7	1.6 V ± .13 V	2.6 V ± .2 V

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3.6.6.6 Switch heater power to OFF.

3.7 Select Component Selection

3.7.1 Reference Voltage (± 3.75 V, -9 V)

3.7.1.1 R136, R137, R141 were selected and installed at the board assembly level (200061).

*3.7.1.2 Verify:

- o J3-23 = -8.18 V ± 45 mV (-9.0 V unloaded)
- o J9-1 = -3.75 V ± 75 mV
- o J9-16 = +3.75 V ± 75 mV.

3.7.2 2 fo Filter, Sweep Oscillator

3.7.2.1 R80, R81, R82, R83, R113 were selected and installed at the board assembly level (200059).

3.7.3 Over Range, Under Range

3.7.3.1 R7, R15, R25, R33, R43, R51 were selected and installed at the board assembly level (200061).

3.7.4 Bessel Filters

3.7.4.1 C8, C12, C9, C92; C23, C27, C24, C91; C38, C42, C39, C90 were selected and installed at the board assembly level (200059).

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3.7.5 X, Y, Z Sweep Currents

3.7.5.1 Install a decade resistor for:

- o R113 set to 30.1 K ohms (200059)
- o R114 set to 30.1 K ohms (200059)
- o R115 set to 82.5 K ohms (200059).

*3.7.5.2 Using a differential input oscilloscope, adjust the decade resistors until the following is obtained:

X, Y -

$$I_{coil} = \frac{E \text{ o-pk (across decade resistor)}}{R \text{(decade resistance)}} = 105.9\ \mu A \pm 8\ \mu A;$$

Z -

$$I_{coil} = \frac{E}{R} \text{ o-pk (across decade resistor)} = 98.5\ \mu A \pm 8\ \mu A.$$

Record $I_{X,\ Y,\ Z}$ and R113, R114, R115 resistor values.

*3.7.5.3 Temporarily replace the decade resistor with nearest standard RNC55H resistor. Record the value.

*3.7.5.4 Verify:

For X, Y $I_{coil} = \frac{E_{o\text{-}pk}}{R} = 105.9\ \mu A \pm 8\ \mu A$

For Z $I_{coil} = \frac{E_{o\text{-}pk}}{R} = 98.5\ \mu A \pm 8\ \mu A$.

3.7.6 Igniter

3.7.6.1 C84, C85, C86 were selected and installed per 3.6.2.5.

3.7.7 Zero Field Offset

3.7.7.1 R118, R121, R124 will be selected during system test at JPL. See section 3.9.

3.7.8 Scale Factor, CMD IFC, Auto IFC

3.7.8.1 Nominal resistors values (see SCH200059) for R126, R128, R131, R133, R135, R137, R138, R139, R140, R141, R143, R146, R147, R148, R150, R153, R156 were installed on the board assembly level. Final resistor selection will be determined during system test at JPL.

3.7.9 Integrator, Gain Select, AGC, Integrator dc Offset

3.7.9.1 Adjust R61 (200059) for an output of 1.6 V p-p at AR15-7 (AGC output).

3.7.9.2 Install a 16.5 K ohm resistor for R88 (200059); this should result in a gain change of approximately eight between range 0 and range 1. Final selection will be determined at system test at JPL.

3.7.9.3 Integrator offset will be adjusted at system test at JPL. Temporarily install 49.9 ohm resistors for R6, R20, R34 (200059).

*3.7.9.4 Adjust R5, R19, R33 (90.9 K nominal - 200059) for an average bandwidth of 12 Hz $^{+3}_{-2}$ Hz at the X, Y, Z wideband outputs. Record the resistor values and install temporarily. Perform in range 0, and range 1 at output of 1.0 V $_{o\text{-}pk}$.

3.7.10 Crosstalk (Reference Generator - 200059)

3.7.10.1 For specific details on crosstalk adjustment, see DN200036-61.

3.7.10.2 Replace:

- o Set in range 1
- o R104, R105 with decade resistor
- o R90, R91 with decade resistor
- o R123 with decade resistor
- o Connect a 40 K ohm resistor to J4-9 (X), J4-23 (Y), J4-12 (Z) (coil drives).

*3.7.10.3 Connect the output of the function generator (set to 1 Hz) to J4-9 resistor, and adjust generator output until an output of 120 gamma p-p is noted at "X" output. Adjust R90, R91 to minimize crosstalk into the "Y" output (sideband). Record "Y" output, and resistor values.

*3.7.10.4 Disconnect function generator and connect to J4-12 resistor and adjust generator for an output of 120 gamma p-p at "Z" output. Adjust R123 to minimize crosstalk into the "X" output. Record the "X" output and the resistor value.

*3.7.10.5 Disconnect function generator and connect to J4-9 resistor and adjust generator for an output of 120 gamma p-p at "X" output. Adjust R104, R105 to minimize crosstalk into the "Z" axis. Record the "Z" axis output and the resistor value.

*3.7.10.6 Repeat 3.7.10.3 to 3.7.10.5 as required to reduce crosstalk to less than or equal to .8 gamma p-p on each channel, as follows:

- o X into Y $\leq$ .8 gamma p-p
- o Y into X $\leq$ .8 gamma p-p
- o X into Z $\leq$ .8 gamma p-p

- o Z into X $\leq$ .8 gamma p-p
- o Y into Z $\leq$ .8 gamma p-p
- o Z into Y $\leq$ .8 gamma p-p.

*3.7.10.7 Power OFF. Temporarily install an equivalent RNC55H resistor for R90, R91, R123, R104, R105. Record the resistor values.

*3.7.10.8 Temporarily install an equivalent RNC55H resistor for R89, R102, R126, where:

- o R89 = R90 + R91//100 K
- o R102 = R105 + R104//100 K
- o R126 = R123.

Record the resistor value.

*3.7.10.9 Power ON. Repeat 3.7.10.6, except for resistor selection.

3.7.10.10 Power OFF. Remove resistor connected to J4-9, 23, 12.

3.8 <u>System Test/Temperature Test</u>

The following bench system integration test is intended as a go/no-go test to determine the basic system requirements. Final system testing will be performed at JPL (see section 3.9, 3.10).

3.8.1 Sensor Ignition

3.8.1.1 Set up per Figure 3.

3.8.1.2 Set Manual Range (BCE) to AUTO; and HSK to No. 1.

*3.8.1.3 Power ON. Within 60 seconds of power turn on, verify an output of 3.8 V $\pm$ .25 V on HSK No. 1 (Det Bias Output).

*3.8.1.4 Power OFF. Repeat 3.8.1.3, ten times.

3.8.2 RF Outputs

*3.8.2.1 Verify the following:

- o J5 = 16 V p-p ± 1 V p-p
- o P6 = 30 V p-p ± 1.5 V p-p

3.8.3 LVPS Outputs

*3.8.3.1 Measure and record the following

- o Bias V = - 6.36 V ± .14 V (unloaded by BCE = -7.0 V)
- o ref_V = - 8.18 V ± .18 V (unloaded by BCE = -9.0 V)
- o 3.75 V = + 3.75 V ± .075 V
- o -3.75 V = -3.75 V ± .075 V
- o +12 V = +12 V ± .6 V
- o -12 V = -12 V ± .6 V
- o +12 V_{ref} = $+12_{rf}$ V ± .1 V
- o +6.3 V = 6.3 V ± .6 V
- o -6.3 V = -6.3 V ± .6 V
- o +10 V = +10 V ± .5 V
- o +32 V = +32 V ± 1.6 V.

*3.8.3.2 Measure and record the $I_{28\ V}$ input current at J1-3, 4. The input current shall be less than or equal to 150 mA.

*3.8.3.3 Verify a sync frequency of 57,344 Hz ± 300 Hz at U2-2.

*3.8.3.4 Open J1-9; verify a sync frequency of 55,000 Hz minimum at U2-2. Close J1-9.

3.8.4 Heater

3.8.4.1 Set HSK to No. 4. Set RT2 to 600 ohms.

*3.8.4.2 Switch Heater Power (BCE) to ON. Verify an output of 0 ± .7 V on HSK No. 4.

*3.8.4.3 Record input heater current at J1-2, 6.

*3.8.4.4 Set RT2 to 400 ohms. Verify an output of 4.8 V ± .2 V on HSK No. 4. Record an input heater current of 36 mA ± 4 mA.

3.8.4.5 Switch Heater Power to OFF.

3.8.5 Analog Housekeeping Outputs

*3.8.5.1 Verify the following outputs on the BCE DVM.

BCE HSK Switch	DVM Output	Mode
0	0.1 V maximum	2 fo mon. = OFF
	2.0 V ± .3 V	2 fo mon. = ON
1	0.1 V maximum	DBC = OFF
	3.8 V ± .25 V	DBC = ON
2	3.0 V ± .5 V	Lamp mon. (sensor OFF)
	3.0 V ± .5 V	Lamp mon. (sensor ON)
3	3.0 V ± .5 V	Cell mon. (sensor OFF)
	3.0 V ± .5 V	Cell mon. (sensor ON)
4	0.7 V maximum	Heater mon. = OFF
	4.8 V ± .5 V	Heater mon. = ON
5	2.2 V ± .2 V	(2.5 V ± .2 V unloaded)
6	1.6 V ± .2 V	(2.6 V ± .2 V unloaded)
7	1.6 V ± .2 V	(2.6 V ± .2 V unloaded)

3.8.6 Manual Ranging

3.8.6.1 Set the Manual Range switch on the BCE to "MAN" (up). Set range to "1" (up).

*3.8.6.2 Adjust the X, Y, Z null field controls on the flux tank control unit until the "X", "Y", "Z" field outputs (BCE) are less than or equal to ± 0.05 V. Record the outputs.

*3.8.6.3 Apply the fields noted below, and verify the noted outputs on "X", "Y", "Z".

Field (γ)	Range	X, Y, Z Output (Volt)
10	1	.781 ± 10 %
20	1	1.56 ± 10 %
30	1	2.34 ± 10 %
40	1	3.13 ± 10 %
50	1	3.91 ± 10 %
60	1	4.69 ± 10 %
-10	1	- .781 ± 10 %
-20	1	-1.56 ± 10 %
-30	1	-2.34 ± 10 %
-40	1	-3.13 ± 10 %
-50	1	-3.91 ± 10 %
-60	1	-4.69 ± 10 %
2	0	1.25 ± 10 %
4	0	2.5 ± 10 %
6	0	3.75 ± 10 %
8	0	5.0 ± 10 %
-2	0	-1.25 ± 10 %
-4	0	-2.5 ± 10 %
-6	0	-3.75 ± 10 %
-8	0	-5.0 ± 10 %

3.8.7 Auto Ranging/Over Range, Under Range

3.8.7.1 Set the Manual Range switch on the BCE to Auto (down).

*3.8.7.2 Null the flux tank field to 0 gamma. Verify an output of less than ±0.1 V on the "X", "Y", "Z" outputs.

*3.8.7.3 Set the field to +7.5 gamma in the "X" axis. Verify an output of 4.68 V ± .46 V on the "X" field output.

*3.8.7.4 Increase the field to 8.1 gamma. Verify the Oper. Range LED goes ON. Verify an output of .63 V ± .06 V on the "X" output.

*3.8.7.5 Verify the Over Range LED (BCE) is OFF.

*3.8.7.6 Apply a field of 75 gamma in the "X" axis. Verify the Over Range LED is ON.

*3.8.7.7 Slowly decrease the field to 7.0 gamma. Oper. Range LED should be still ON.

*3.8.7.8 Decrease the field to 6.0 gamma. Verify the Oper. Range LED is OFF. Verify the "X" field output is 3.75 V ± .4 V.

*3.8.7.9 Repeat 3.8.7.3 to 3.8.7.8 for a -7.5 gamma input.

*3.8.7.10 Repeat 3.8.7.3 to 3.8.7.9 for the "Y", "Z" axis.

3.8.8 Auto IFC

*3.8.8.1 Repeat 3.6.5.9 through 3.6.5.13.

3.8.9 CMD IFC

*3.8.9.1 Repeat 3.6.5.1 through 3.6.5.8.

3.8.10 Wideband Outputs, Frequency Response

3.8.10.1 Set up the flux tank for A-C operation (see Appendix A). Set to 0.1 Hz.

3.8.10.2 Set the BCE to Range 0 (manual mode).

3.8.10.3 Apply a field of 3.2 gamma p-p ± .05 gamma.

3.8.10.4 Connect the "X" WBO (P9-33) to an oscilloscope.

*3.8.10.5 Sweep from .01 Hz to 20 Hz. Verify -3 db roll-off at 12 Hz $^{+3}_{-2}$ Hz.

*3.8.10.6 Repeat 3.8.10.3 through 3.8.10.5 for the "Y" (P9-32) and "Z" (P9-50).

3.8.10.7 Set the range to "1".

3.8.10.8 Apply a field of 25.6 gamma p-p.

*3.8.10.9 Repeat 3.8.10.4 through 3.8.10.6.

3.8.11 Crosstalk

3.8.11.1 Calibrate the brush recorder for 2.0 gamma p-p = 40 div.

3.8.11.2 Set the flux tank for A-C operation.

3.8.11.3 Set the instrument in manual mode; range 1. Connect a 40 K ohm resistor to J4-9, 23, 12.

*3.8.11.4 Connect the output of the function generator (set to 1 Hz) to J4-9 resistor and adjust the generator output until an output of 100 gamma p-p is noted at the "X" WB output. Measure and record the crosstalk in the "Y", "Z" axis on the recorder. The crosstalk shall be less than or equal to 1.74 gamma p-p.

*3.8.11.5 Connect function generator output to the J4-23 resistor. Adjust the generator output until an output of 100 gamma p-p is noted at the "Y" WB output. Measure and record the crosstalk in the "X", "Z" axis. The crosstalk shall be less than or equal to 1.74 gamma p-p.

*3.8.11.6 Connect the function generator output to the J9-12 resistor. Adjust the generator output until a 100 gamma p-p is noted at the "Z" WB output. Measure and record the crosstalk in the "X", "Y" axis. The crosstalk shall be less than or equal to 1.74 gamma p-p.

3.8.12 Input Noise Susceptability

3.8.12.1 Set up per Figure 6.

3.8.12.2 Set the oscillator to 20 Hz.

3.8.12.3 Calibrate the brush recorder for 0.2 gamma p-p = 20 div.

3.8.12.4 Connect the "X" field output to the brush recorder. Set the instrument in range 0.

*3.8.12.5 With the recorder running, sweep the oscillator from 20 Hz to 5 kHz. The maximum noise noted on the "X", "Y", "Z" field outputs shall be less than or equal to 0.02 gamma p-p.

3.8.12.6 Set the instrument in range "1". Calibrate the recorder for 2 gamma p-p = 20 div.

*3.8.12.7 Repeat 3.8.12.5. The noise shall be less than or equal to 0.2 gamma p-p.

3.8.12.8 Power OFF. Reconnect per Figure 3.

3.8.13 Ditial Status Data Display

3.8.13.1 Set Manual Range (on the BCE) to "0"; set Ignition Inhibit (on the BCE) to "1". All other switches shall be at "0".

*3.8.13.2 Power ON. Verify all digital status LEDS are off, except Ignition Status, signal status and ing. inhibit.

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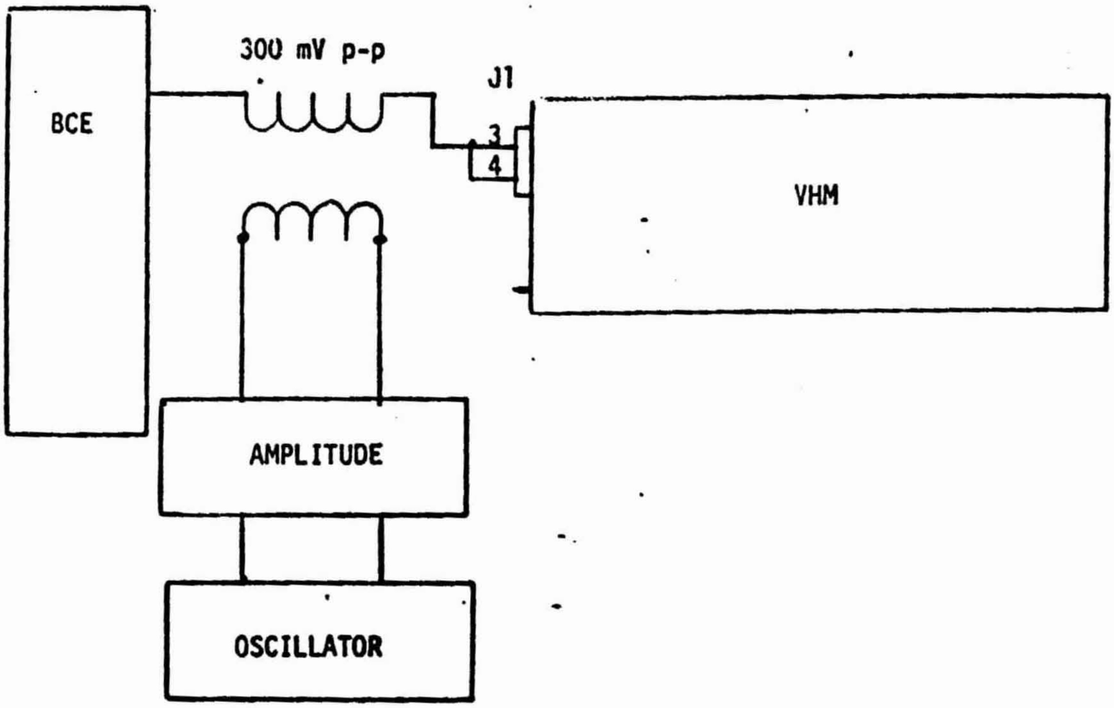

Figure 6

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*3.8.13.3 Set Ignition Inhibit to "0". Verify Ignition Inhibit and Ignition Status LED turn OFF. P.A. sig. is ON.

*3.8.13.4 Set Manual Range to "1". Verify Manual Range LED in ON.

*3.8.13.5 Set Range switch to "1". Verify Oper. Range LED is ON.

*3.8.13.6 Set CMD IFC to "1". Verify CMD IFC LED is ON.

*3.8.13.7 Set CMD IFC to "0". Set Auto IFC to "1". Verify Auto IFC LED is ON.

3.8.13.8 Set Auto IFC to "0".

3.8.13.9 Power OFF.

3.8.14 Temperature Tests

3.8.14.1 Set the instrument in a temperature chamber.

*3.8.14.2 Repeat 3.8.1, 3.8.3.1, 3.8.3.2; 3.8.4 through 3.8.10, 3.8.13 at -30° C ± 2° C.

*3.8.14.3 Repeat 3.8.1, 3.8.3.1, 3.8.3.2; 3.8.4 through 3.8.10, 3.8.13 at at +60° C ± 2° C.

3.9 <u>Electrical Test - Final Selection of SAT Components and Test</u>

The following test and measurements shall be conducted at the JPL Magnetic test facility. The following test sequence shall be deemed as the minimum test requirement; any additional test performed shall be documented and data recorded as applicable. The test sequence for each test shall be determined by JPL technical personnel. The test results shall meet the requirements of 16828-11, Functional Requirements for VHM. All selection test (SAT) components shall be permanently installed by certified BASD/WL personnel. All SAT components shall be documented in the appropriate data sheet (WL4-8A).

Any graph paper or charts containing pertinent data shall be attached to the data sheets.

*3.9.1 Sensor Ignition

*3.9.2 Auto Ranging

*3.9.3 Manual Ranging

*3.9.4 Preamplifier Output

*3.9.5 Analog Housekeeping Outputs

A. 2 fo monitor
B. Detector bias current monitor
C. Lamp output monitor
D. Cell output monitor
E. Heater monitor
F. ± 3.75 V monitor
G. ± 12 V monitor
H. ± 6.3 V monitor.

*3.9.6 Ignition Voltage

*3.9.6.1 Reselect C85, C86, C84, if required.

*3.9.7 Ignition Coil Return Output

*3.9.8 AGC Output

*3.9.8.1 Select R61, as required.

*3.9.9 Notch Filter Output Spectrum

A. 1/2 fo
B. fo
C. 3/2 fo
D. 2 fo
E. 5/2 fo
F. 3 fo
G. 7/2 fo
H. 4 fo

*3.9.10 -9 Volt Output

*3.9.11 ± 3.75 Output

*3.9.12 Z Demod/Sweep Phases

*3.9.13 + 32 V Output

*3.9.14 + 10 V Output

*3.9.15 ± 12 V Output

*3.9.16 ± 6.3 V Output

*3.9.17 + 12 V_{rf} Output

3.9.17.1 Reselect R28, if required.

*3.9.18 Thermistor Resistance

*3.9.19 RF Supply Output Voltages

*3.9.20 RF Supply Output Noise

*3.9.21 LVPS Sync Frequency

*3.9.22 Wideband Outputs, Frequency Response

3.9.22.1 Select R88, R5, R19, R33.

*3.9.23 Crosstalk

3.9.23.1 Select R104, R105, R102, R89, R90, R91, R123, R126.

*3.9.24 Scale Factor

3.9.24.1 Select R126, R128, R131, R133, R135, R137.

*3.9.25 Over Range, Under Range Thresholds

*3.9.26 IFC

3.9.26.1 Select R136, R139, R140, R141, R142, R143

*3.9.27 Offset

3.9.27.1 Select R124, R121, R118.

*3.9.28 Auto IFC

3.9.28.1 Select R146, R150, R147, R153, R148, R156.

*3.9.29 Output Noise Density

*3.9.30 Output dc Offset

3.9.30.1 Select R6, R20, R34.

*3.9.31 Commands/Data Outputs

*3.9.32 Sweep Oscillator Frequency

*3.9.33 Sweep Amplitude

*3.9.33.1 Select R113, R114, R115.

3.9.34 Output Linearity

3.10 Temperature Test

*3.10.1 Repeat 3.9 at -30° C ± 2° C.

3.11 Temperature Test

*3.11.1 Repeat 3.9 at +60° C ± 2° C.

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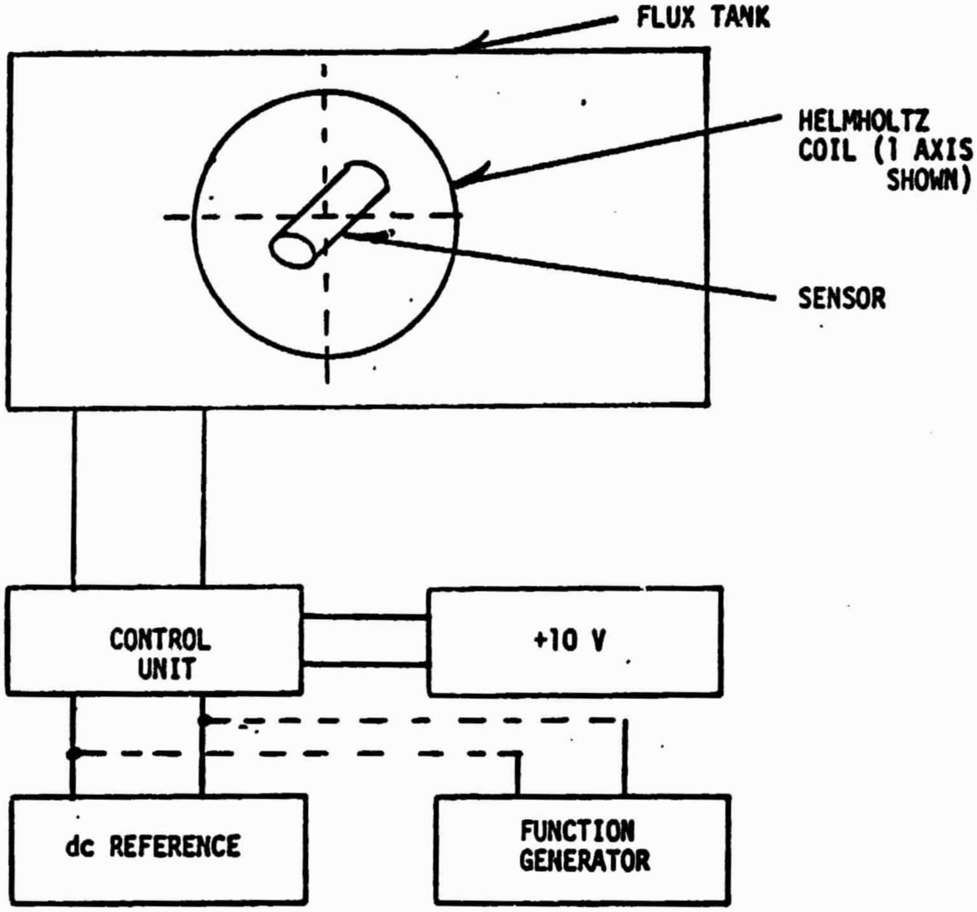
APPENDIX A



The sensor must be physically located in the Helmholtz coil. The function generation shall replace the dc reference when generating A-C magnetic fields.

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TEST DATA SHEET

TEST SPECIFICATION NUMBER S 200036 REV A DATE ASSEMBLY S/N

TEST DATA

PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT MINIMUM	ACTUAL	MAXIMUM	REMARKS
3.6.1.3	$I_{28\ V}$	--		175 mA	
3.6.1.4	+12 V_{rf}	11.9 V		12.1 V	
	-12 V	-11.4 V		- 12.6 V	
	+12 V	11.4 V		12.6 V	
	- 6.3 V	- 5.7 V		- 6.9 V	
	+ 6.3 V	5.7 V		6.9 V	
	+10 V	9.5 V		10.5 V	
	+ 3.75 V	3.65 V		3.85 V	
	- 3.75 V	- 3.65 V		- 3.85 V	
3.6.1.5	U1-1 Output				
	T_0	15.4 µs		19.4 µs	
	"0"	--		0.5 V	
	"1"	9.5 V		11.5 V	
	Freq.	57,294 Hz		57,394 Hz	
	Jitter	--		<10 %	
3.6.1.7	J8-1	- 0.7 V		+ 0.7 V	

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TEST DATA SHEET

TEST SPECIFICATION NUMBER S 200036 REV A DATE ASSEMBLY S/N

TEST DATA

PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT MINIMUM	ACTUAL	MAXIMUM	REMARKS
3.6.1.8	J8-1	4.6 V		5.0 V	
3.6.1.9	J5	15 V p-p		17 V p-p	
	P6	28.5 V p-p		31.5 V p-p	
3.6.2.4	P9-36	8 V		10 V	
3.6.2.5	J4-3				
	Peak Volt	30 V		--	
	Freq.	100 kHz		130 kHz	
3.6.2.6	C85	--		--	
	C86	--		--	
3.6.2.9	Det. Bias Output (HSK No. 1)	3.55 V		4.05 V	
3.6.2.11	J4-3 Peak Output	30 V		--	
	Freq.	100 kHz		130 kHz	

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PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT MINIMUM	ACTUAL	MAXIMUM	REMARKS
3.6.3.4	28 $V_{(I)}$	--		175 mA	
3.6.3.5	HSK No. 1	3.55 V		4.05 V	
	Signal Status (LED)	ON/OFF		ON/OFF	
	Manual Range (LED)	ON		ON	
	Auto IFC (LED)	OFF		OFF	
	CMD IFC (LED)	OFF		OFF	
	Over Range (LED)	ON		ON	
	Ign. Status (LED)	ON/OFF		ON/OFF	
	Ign. Switch (LED)	ON/OFF		ON/OFF	
	Oper. Range (LED)	ON		ON	
3.6.3.9	HSK No. 1	3.55 V		4.05 V	
	Signal Status (LED)	ON		ON	
	Manual Range (LED)	ON		ON	
	Auto IFC (LED)	OFF		OFF	
	CMD IFC (LED)	OFF		OFF	
	Over Range (LED)	OFF		OFF	
	Ign. Status (LED)	OFF		OFF	
	Ign. Switch (LED)	OFF		OFF	
	Oper. Range (LED)	ON		ON	

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PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT MINIMUM	ACTUAL	MAXIMUM	REMARKS
3.6.3.10	X	--		6.0 V	
	Y	--		6.0 V	
	Z	--		6.0 V	
3.6.3.11	X	--		0.1 V	
	Y	--		0.1 V	
	Z	--		0.1 V	
3.6.3.12	HSK No. 0	1.7 V		2.3 V	
	HSK No. 1	3.55 V		4.05 V	
3.6.3.14	X	3.1 V		4.7 V	
	Y	3.1 V		4.7 V	
	Z	3.1 V		4.7 V	
3.6.3.16	X	- 3.1 V		- 4.7 V	
	Y	- 3.1 V		- 4.7 V	
	Z	- 3.1 V		- 4.7 V	

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PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT			REMARKS
		MINIMUM	ACTUAL	MAXIMUM	
3.6.3.19	Oper. Range (LED)	OFF		OFF	
3.6.3.20	X	-		0.5 V	
	Y	-		0.5 V	
	Z	-		0.5 V	
3.6.3.22	X	3.875 V		4.875V	
	Y	3.875 V		4.875V	
	Z	3.875 V		4.875V	
3.6.3.24	X	- 3.875V		- 4.875V	
	Y	- 3.875V		- 4.875V	
	Z	- 3.875V		- 4.875V	
3.6.4.1	X	--		0.5 V	
	Y	--		0.5 V	
	Z	--		0.5 V	
	Oper. Range (LED)	OFF		OFF	

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PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT			REMARKS
		MINIMUM	ACTUAL	MAXIMUM	
3.6.4.2	Oper. Range (LED)	ON		ON	
	Field "X"	7.8 γ		8.2 γ	
3.6.4.3	X	.52 V		.72 V	
3.6.4.4	Oper. Range (LED)	OFF		OFF	
	SW. PT. "X"	.4 V		.6 V	
3.6.4.5 (3.6.4.2)	Oper. Range "Y" (LED)	ON		ON	
	"Z"	ON		ON	
	Field "Y"	7.8 γ		8.2 γ	
	"Z"	7.8 γ		8.2 γ	
(3.6.4.3)	"Y"	.52 V		.72 V	
	"Z"	.52 V		.72 V	
(3.6.4.4)	Oper. Range "Y" (LED)	OFF		OFF	
	"Z"	OFF		OFF	
	SW. PT. "Y"	.4 V		.6 V	
	SW. PT. "Z"	.4 V		.6 V	
3.6.5.1	"X"	-.1 V		.1 V	
	"Y"	-.1 V		.1 V	
	"Z"	-.1 V		.1 V	

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PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT			REMARKS
		MINIMUM	ACTUAL	MAXIMUM	
3.6.5.3	X	- 2.25 V		- 2.75 V	
	Y	- 2.25 V		- 2.75 V	
	Z	- 2.25 V		- 2.75 V	
	X	+ 2.25 V		+ 2.75 V	
	Y	+ 2.25 V		+ 2.76 V	
	Z	+ 2.25 V		+ 2.75 V	
3.6.5.5	X	- .05 V		+ .05 V	
	Y	- .05 V		+ .05 V	
	Z	- .05 V		+ .05 V	
3.6.5.7	X	- 2.25 V		- 2.75 V	
	Y	- 2.25 V		- 2.75 V	
	Z	- 2.25 V		- 2.75 V	
	X	+ 2.25 V		+ 2.75 V	
	Y	+ 2.25 V		+ 2.75 V	
	Z	+ 2.25 V		+ 2.75 V	

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PARAGRAPH NUMBER	TEST PARAMETER		TOLERANCE OR LIMIT			REMARKS
			MINIMUM	ACTUAL	MAXIMUM	
3.6.5.10	Range 1	"X"	3.2 Y		4.8 Y	
3.6.5.11	Range 1	"Y"	3.2 Y		4.8 Y	
	Range 1	"Z"	3.2 Y		4.8 Y	
3.6.5.13	Range 0	"X"	0.4 Y		0.6 Y	
		"Y"	0.4 Y		0.6 Y	
		"Z"	0.4 Y		0.6 Y	
3.6.6.3	HSK No. 0		- 0.1 V		0.1 V	
	1		- 0.1 V		0.1 V	
	2		2.5 V		3.5 V	
	3		2.5 V		3.5 V	
	4		- 0.7 V		0.7 V	
	5		2.0 V		2.4 V	
	6		1.47 V		1.73 V	
	7		1.47 V		1.73 V	

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PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT			REMARKS
		MINIMUM	ACTUAL	MAXIMUM	
3.6.6.5	HSK No. 0	1.7 V		2.3 V	
	1	3.55 V		4.05 V	
	2	2.5 V		3.5 V	
	3	2.5 V		3.5 V	
	4	4.6 V,		5.0 V	
	5	2.0 V		2.4 V	
	6	1.47 V		1.73 V	
	7	1.47 V		1.73 V	
3.7.1.2	J3-23	- 8.135 V		- 8.225 V	
	J9-1	- 3.675V		- 3.825V	
	J9-16	3.675V		3.825V	
3.7.5.2	I_{coil} (X)	97.9 μa		113.9 μa	
	(Y)	97.9 μa		113.9 μa	
	(Z)	90.5 μa		106.5 μa	
	R113	--		--	
	R114	--		--	
	R115	--		--	

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PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT			REMARKS
		MINIMUM	ACTUAL	MAXIMUM	
3.7.5.3	R113 --	--		--	
	R114	--		--	
	R115	--		--	
3.7.5.4	I_{coil} (X)	97.9 μA		113.9 μA	
	(Y)	97.9 μA		113.9 μA	
	(Z)	90.5 μA		106.5 μA	
3.7.9.4	Bandwidth Range 0 (X)	10 Hz		15 Hz	
	Range 0 (Y)	10 Hz		15 Hz	
	Range 0 (Z)	10 Hz		15 Hz	
	Bandwidth Range 1 (X)	10 Hz		15 Hz	
	Range 1 (Y)	10 Hz		15 Hz	
	Range 1 (Z)	10 Hz		15 Hz	
	R5	--		--	
	R19	--		--	
	R33	--		--	
3.7.10.3	Crosstalk "Y"	--		--	
	R90	--		--	
	R91	--		--	

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PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT MINIMUM	ACTUAL	MAXIMUM	REMARKS
3.7.10.4	Crosstalk "X"	--		--	
	R123	--		--	
3.7.10.5	Crosstalk "Z"	--		--	
	R104	--		--	
	R105	--		--	
3.7.10.6	X into Y	--		0.8 γ p-p	
	Y into X	--		0.8 γ p-p	
	X into Z	--		0.8 γ p-p	
	Z into X	--		0.8 γ p-p	
	Y into Z	--		0.8 γ p-p	
	Z into Y	--		0.8 γ p-p	
3.7.10.7	R90	--		--	
	R91	--		--	
	R123	--		--	
	R104	--		--	
	R105	--		--	

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PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT MINIMUM	ACTUAL	MAXIMUM	REMARKS
3.7.10.8	R89	--		--	
	R102 --	--		--	
	R126	--		--	
3.7.10.9	X into Y	--		0.8 γ p-p	
	Y into X	--		0.8 γ p-p	
	X into Z	--		0.8 γ p-p	
	Z into X	--		0.8 γ p-p	
	Y into Z	--		0.8 γ p-p	
	Z into Y	--		0.8 γ p-p	
3.8.1.3	HSK No. 1	3.55 V		4.05 V	
3.8.1.4	HSK No. 1 1.	3.55 V		4.05 V	
	2.	3.55 V		4.05 V	
	3.	3.55 V		4.05 V	
	4.	3.55 V		4.05 V	
	5.	3.55 V		4.05 V	
	6.	3.55 V		4.05 V	
	7.	3.55 V		4.05 V	

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PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT			REMARKS
		MINIMUM	ACTUAL	MAXIMUM	
3.8.1.4 (Continued)	8.	3.55 V		4.05 V	
	9.	3.55 V		4.05 V	
	10.	3.55 V		4.05 V	
3.8.2.1	J5	15 V p-p		17 V p-p	
	P6	28.5 V p-p		31.5 V p-p	
3.8.3.1	Bias V	- 6.22 V		- 6.5 V	
	Ref. V	- 8.0 V		- 8.36 V	
	3.75 V	3.675V		3.825V	
	-3.75 v	- 3.675V		- 3.825V	
	+12 V	11.4 V		12.6 V	
	-12 V	-11.4 V		- 12.6 V	
	+12 V_{rf}	11.9 V		12.1 V	
	6.3 V	5.7 V		6.9 V	
	-6.3 V	- 5.7 V		- 6.9 V	
	+10 V	9.5 V		10.5 V	
	+32 V	30.4 V		33.6 V	

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PARAGRAPH NUMBER	TEST PARAMETER		TOLERANCE OR LIMIT MINIMUM	ACTUAL	MAXIMUM	REMARKS
3.8.3.2	$I_{28\ V}$	J1-3, 4	--		150 mA	
3.8.3.3	U2-2		57,044 Hz		57,644 Hz	
3.8.3.4	U2-2		55,000 Hz		--	
3.8.4.2	HSK No. 4		- .7 V		.7 V	
3.8.4.3	J1-2, 6		--		--	
3.8.4.4	HSK No. 4		4.6 V		5.0 V	
	I_{Heater}		32 mA		40 mA	
3.8.5.1	HSK No. 0		--		0.1 V	OFF
			1.7 V		2.3 V	ON
	1		--		0.1 V	OFF
			3.55 V		4.05 V	ON
	2		2.5 V		3.5 V	OFF
			2.5 V		3.5 V	ON

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PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT			REMARKS
		MINIMUM	ACTUAL	MAXIMUM	
3.8.5.1 (Continued)	3	2.5 V		3.5 V	OFF
		2.5 V		3.5 V	ON
	4	--		0.7 V	OFF
		4.3 V		5.3 V	ON
	5	2.0 V		2.4 V	
	6	1.4 V		1.8 V	
	7	1.4 V		1.8 V	
3.8.6.2	X	-.05 V		.05 V	
	Y	-.05 V		.05 V	
	Z	-.05 V		.05 V	
3.8.6.3 "X"	10γ Range 1	.703V		.859V	
	20γ Range 1	1.404V		1.716V	
	30γ Range 1	2.106V		2.574V	
	40γ Range 1	2.817V		3.443V	
	50γ Range 1	3.519V		4.301V	

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PARAGRAPH NUMBER	TEST PARAMETER		TOLERANCE OR LIMIT			REMARKS
			MINIMUM	ACTUAL	MAXIMUM	
3.8.6.3 (Continued) "X"	60γ	Range 1	4.221V		5.159V	
	-10γ	Range 1	- .703V		- .859V	
	-20γ	Range 1	- 1.404V		- 1.716V	
	-30γ	Range 1	- 2.106V		- 2.574V	
	-40γ	Range 1	- 2.817V		- 3.443V	
	-50γ	Range 1	- 3.519V		- 4.301V	
	-60γ	Range 1	- 4.221V		- 5.159V	
	2γ	Range 0	1.125V		1.375V	
	4γ	Range 0	2.25 V		2.75 V	
	6γ	Range 0	3.375V		4.125V	
	8γ	Range 0	4.5 V		5.5 V	
	- 2γ	Range 0	- 1.125V		- 1.375V	
	- 4γ	Range 0	- 2.25 V		- 2.75 V	
	- 6γ	Range 0	- 3.375V		- 4.125V	
	- 8γ	Range 0	- 4.5 V		- 5.5 V	

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PARAGRAPH NUMBER	TEST PARAMETER		TOLERANCE OR LIMIT			REMARKS
			MINIMUM	ACTUAL	MAXIMUM	
3.8.6.3 (Cont.) "Y"	10 Y	Range 1	.703 V		.859 V	
	20 Y	Range 1	1.404 V		1.716 V	
	30 Y	Range 1	2.106 V		2.574 V	
	40 Y	Range 1	2.817 V		3.443 V	
	50 Y	Range 1	3.519 V		4.301 V	
	60 Y	Range 1	4.221 V		5.159 V	
	-10 Y	Range 1	- .703 V		- .859 V	ORIGINAL PAGE IS OF POOR QUALITY
	-20 Y	Range 1	- 1.404 V		- 1.716 V	
	-30 Y	Range 1	- 2.106 V		- 2.574 V	
	-40 Y	Range 1	- 2.817 V		- 3.443 V	
	-50 Y	Range 1	- 3.519 V		- 4.301 V	
	-60 Y	Range 1	- 4.221 V		- 5.159 V	
	2 Y	Range 0	1.125 V		1.375 V	
	4 Y	Range 0	2.25 V		2.75 V	
	6 Y	Range 0	3.375 V		4.125 V	
	8 Y	Range 0	4.5 V		5.5 V	
	-2 Y	Range 0	- 1.125 V		- 1.375 V	
	-4 Y	Range 0	- 2.25 V		- 2.75 V	
	-6 Y	Range 0	- 3.375 V		- 4.125 V	
	-8 Y	Range 0	- 4.5 V		- 5.5 V	

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PARAGRAPH NUMBER	TEST PARAMETER		TOLERANCE OR LIMIT MINIMUM	ACTUAL	MAXIMUM	REMARKS
3.8.6.3 (Cont.) "Z"	10 γ	Range 1	.703 V		.859 V	
	20 γ	Range 1	1.404 V		1.716 V	
	30 γ	Range 1	2.106 V		2.574 V	
	40 γ	Range 1	2.817 V		3.443 V	
	50 γ	Range 1	3.519 V		4.301 V	
	60 γ	Range 1	4.221 V		5.159 V	
	-10 γ	Range 1	- .703 V		- .859 V	ORIGINAL PAGE IS OF POOR QUALITY
	-20 γ	Range 1	-1.404 V		-1.716 V	
	-30 γ	Range 1	-2.106 V		-2.574 V	
	-40 γ	Range 1	-2.817 V		-3.443 V	
	-50 γ	Range 1	-3.519 V		-4.301 V	
	-60 γ	Range 1	-4.221 V		-5.159 V	
	2 γ	Range 0	1.125 V		1.375 V	
	4 γ	Range 0	2.25 V		2.75 V	
	6 γ	Range 0	3.375 V		4.125 V	
	8 γ	Range 0	4.5 V		5.5 V	
	-2 γ	Range 0	-1.125 V		-1.375 V	
	-4 γ	Range 0	-2.25 V		-2.75 V	
	-6 γ	Range 0	-3.375 V		-4.125 V	
	-8 γ	Range 0	-4.5 V		-5.5 V	

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PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT MINIMUM	ACTUAL	MAXIMUM	REMARKS
3.8.7.2	X	-.1 V		0.1 V	
	Y	-.1 V		0.1 V	
	Z	-.1 V		0.1 V	
3.8.7.3	X Output	4.22 V		5.14 V	
3.8.7.4	Oper. Range LED	ON		ON	
	X Output	.57 V		.69 V	
3.8.7.5	Over Range LED	OFF		OFF	
3.8.7.6	Over Range LED	ON		ON	
3.8.7.7	Oper. Range LED	ON		ON	
3.8.7.8	Oper. Range LED	OFF		OFF	
	X Output	3.35 V		4.15 V	

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PARAGRAPH NUMBER		TEST PARAMETER	TOLERANCE OR LIMIT			REMARKS
			MINIMUM	ACTUAL	MAXIMUM	
3.8.7.9	(3.8.7.3)	X Output	4.22 V		5.14 V	
	(3.8.7.4)	Oper. Range LED	ON		ON	
		X Output	.57 V		.69 V	
	(3.8.7.5)	Over Range LED	OFF		OFF	
	(3.8.7.6)	Over Range LED	ON		ON	
	(3.8.7.7)	Oper. Range LED	ON		ON	
	(3.8.7.8)	Oper. Range LED	OFF		OFF	
		X Output	3.35 V		4.15 V	
3.8.7.10	(3.8.7.3)	Y Output	4.22 V		5.14 V	
	(3.8.7.4)	Oper. Range LED	ON		ON	
		Y Output	.57 V		.69 V	
	(3.8.7.5)	Over Range LED	OFF		OFF	

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PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT MINIMUM	ACTUAL	MAXIMUM	REMARKS
3.8.7.10 (Cont.) (3.8.7.6)	Over Range LED	ON		ON	
(3.8.7.7)	Oper. Range LED	ON		ON	
(3.8.7.8)	Oper. Range LED	OFF		OFF	
	Y Output	3.35 V		4.15 V	
3.8.7.10					
(3.8.7.9) (3.8.7.3)	Y Output	4.22 V		5.14 v	
(3.8.7.4)	Oper. Range LED	ON		ON	
	Y Output	.57 V		.69 V	
(3.8.7.5)	Over Range LED	OFF		OFF	
(3.8.7.6)	Over Range LED	ON		ON	
(3.8.7.7)	Oper. Range LED	ON		ON	
(3.8.7.8)	Oper. Range LED	OFF		OFF	
	Y Output	3.35 V		4.15 V	

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PARAGRAPH NUMBER		TEST PARAMETER	TOLERANCE OR LIMIT			REMARKS
			MINIMUM	ACTUAL	MAXIMUM	
3.8.7.10	(3.8.7.3)	Z Output	4.22 V		5.14 V	
	(3.8.7.4)	Oper. Range LED	ON		ON	
		Z Output	.57 V		.69 V	
	(3.8.7.5)	Over Range LED	OFF		OFF	
	(3.8.7.6)	Over Range LED	ON		ON	
	(3.8.7.7)	Oper. Range LED	ON		ON	
	(3.8.7.8)	Oper. Range LED	OFF		OFF	
		Z Output	3.35 V		4.15 V	
(3.8.7.9)	(3.8.7.3)	Z Output	4.22 V		5.14 V	
	(3.8.7.4)	Oper. Range LED	ON		ON	
		Z Output	.57 V		.69 V	
	(3.8.7.5)	Over Range LED	OFF		OFF	

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TEST DATA

PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT MINIMUM	ACTUAL	MAXIMUM	REMARKS
3.8.7.10(3.8.7.9) (3.8.7.[illegible])	Over Range LED	ON		ON	
(3.8.7.7)	Oper. Range LED	ON		ON	
(3.8.7.8)	Oper. Range LED	OFF		OFF	ORIGINAL PAGE IS OF POOR QUALITY
	Z Output	3.35 V		4.15 V	

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PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT MINIMUM	ACTUAL	MAXIMUM	REMARKS
3.8.8.1	(3.6.5.10) Range 1 "X"	3.2 γ		4.8 γ	
	(3.6.5.11) Range 1 "Y"	3.2 γ		4.8 γ	
	Range 1 "Z"	3.2 γ		4.8 γ	ORIGINAL PAGE IS OF POOR QUALITY
	(3.6.5.13) Range 0 "X"	0.4 γ		0.6 γ	
	"Y"	0.4 γ		0.6 γ	
	"Z"	0.4 γ		0.6 γ	
3.8.9.1	(3.6.5.1) X	-.1 V		.1 V	
	Y	-.1 V		.1 V	
	Z	-.1 V		.1 V	
	(3.6.5.3) X	- 2.25 V		- 2.75 V	
	Y	- 2.25 V		- 2.75 V	
	Z	- 2.25 V		- 2.75 V	
	X	+ 2.25 V		+ 2.75 V	
	Y	+ 2.25 V		+ 2.75 V	
	Z	+ 2.25 V		+ 2.75 V	

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PARAGRAPH NUMBER	TEST PARAMETER		TOLERANCE OR LIMIT			REMARKS
			MINIMUM	ACTUAL	MAXIMUM	
3.8.9.1 (Continued)	(3.6.5.5)	X	- .05 V		.05 V	
		Y	- .05 V		.05 V	
		Z	- .05 V		.05 V	
	(3.6.5.7)	X	- 2.25 V		- 2.75 V	
		Y	- 2.25 V		- 2.75 V	
		Z	- 2.25 V		- 2.75 V	
		X	+ 2.25 V		+ 2.75 V	
		Y	+ 2.25 V		+ 2.75 V	
		Z	+ 2.25 V		+ 2.75 V	
3.8.10.5	-3 db	X	10 Hz		15 Hz	
3.8.10.6	-3 db	Y	10 Hz		15 Hz	
		Z	10 Hz		15 Hz	
3.8.10.9	-3 db	X	10 Hz		15 Hz	
		Y	10 Hz		15 Hz	
		Z	10 Hz		15 Hz	

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PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT MINIMUM	ACTUAL	MAXIMUM	REMARKS
3.8.11.4	Y	--		1.74γ p-p	
	Z	--		1.74γ p-p	
3.8.11.5	X	--		1.74γ p-p	
	Z	--		1.74γ p-p	
3.8.11.6	X	--		1.74γ p-p	
	Y	--		1.74γ p-p	
3.8.12.5	X	--		0.02γ p-p	
	Y	--		0.02γ p-p	
	Z	--		0.02γ p-p	
3.8.12.7	X	--		0.2 γ p-p	
	Y	--		0.2 γ p-p	
	Z	--		0.2 γ p-p	
3.8.13.2	Ign. Inhibit	ON		ON	
	Ing. Status	ON		ON	
	Other LEDS	OFF		OFF	
	Signal Status	ON		ON	
3.8.13.3	P.A. LED	ON		ON	
	Other LEDS	OFF		OFF	
3.8.13.4	Man. Range LED	ON		ON	

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TEST DATA

PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT			REMARKS
		MINIMUM	ACTUAL	MAXIMUM	
3.8.13.5	Oper. Range LED	ON		ON	
3.8.13.6	CMD IFC LED	ON		ON	
3.8.13.7	Auto IFC LED	ON		ON	

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TEST DATA

PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT MINIMUM	ACTUAL	MAXIMUM	REMARKS
3.8.1.3	HSK No. 1	3.55 V		4.05 V	
3.C 1.4	HSK No. 1 1.	3.55 V		4.05 V	
	2.	3.55 V		4.05 V	
	3.	3.55 V		4.05 V	
	4.	3.55 V		4.05 V	
	5.	3.55 V		4.05 V	
	6.	3.55 V		4.05 V	
	7.	3.55 V		4.05 V	
	8.	3.55 V		4.05 V	
	9.	3.55 V		4.05 V	
	10.	3.55 V		4.05 V	

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TEST DATA

PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT			REMARKS
		MINIMUM	ACTUAL	MAXIMUM	
3.8.3.1	Bias V.	- 6.22 V		- 6.5 V	
	Ref. V	- 8.0 V		- 8.36 V	
	3.75 V	3.675V		3.825V	
	-3.75 V	- 3.675V		- 3.825V	
	+12 V	11.4 V		12.6 V	
	-12 V	-11.4 V		- 12.6 V	ORIGINAL PAGE IS OF POOR QUALITY
	+12 V_{rf}	11.9 V		12.1 V	
	6.3 V	5.7 V		6.9 V	
	-6.8 V	- 5.7 V		- 6.9 V	
	+10 V	9.5 V		10.5 V	
	+32 V	30.4 V		33.6 V	
3.8.3.2	$I_{28\,V}$ J1-3, 4	--		150 mA	
3.8.4.2	HSK No. 4	- .7 V		.7 V	

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TEST DATA

PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT			REMARKS
		MINIMUM	ACTUAL	MAXIMUM	
3.8.4.3	J1-2, 6	--		--	
3.8.4.4	HSK No. 4	4.6 V		5.0 V	
	I_{Heater}	32 mA		40 mA	
3.8.5.1	HSK No. 0	--		0.1 V	OFF
		1.7 V		2.3 V	ON
	1	--		0.1 V	OFF
		3.55 V		4.05 V	ON
	2	2.5 V		3.5 V	OFF
		2.5 V		3.5 V	ON
	3	2.5 V		3.5 V	OFF
		2.5 V		3.5 V	ON
	4	--		0.7 V	OFF
		4.3 V		5.3 V	ON
	5	2.0 V		2.4 V	
	6	1.4 V		1.8 V	
	7	1.4 V		1.8 V	
3.8.6.2	X	-.05 V		.05 V	
	Y	-.05 V		.05 V	
	Z	-.05 V		.05 V	

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TEST DATA

PARAGRAPH NUMBER	TEST PARAMETER		TOLERANCE OR LIMIT			REMARKS
			MINIMUM	ACTUAL	MAXIMUM	
3.8.6.3 "X"	10 γ	Range 1	.703V		.859V	
	20 γ	Range 1	1.404V		1.716V	
	30 γ	Range 1	2.106V		2.574V	
	40 γ	Range 1	2.817V		3.433V	
	50 γ	Range 1	3.519V		4.301V	
	60 γ	Range 1	4.221V		5.159V	ORIGINAL PAGE IS OF POOR QUALITY
	-10 γ	Range 1	- .703V		- .859V	
	-20 γ	Range 1	- 1.404V		- 1.716V	
	-30 γ	Range 1	- 2.106V		- 2.574V	
	-40 γ	Range 1	- 2.817V		- 3.443V	
	-50 γ	Range 1	- 3.519V		- 4.301V	
	-60 γ	Range 1	- 4.221V		- 5.159V	
	2 γ	Range 0	1.125V		1.375V	
	4 γ	Range 0	2.25 V		2.75 V	
	6 γ	Range 0	3.375V		4.125V	
	8 γ	Range 0	4.5 V		5.5 V	
	- 2 γ	Range 0	- 1.125V		- 1.375V	
	- 4 γ	Range 0	- 2.25 V		- 2.75 V	
	-6 γ	Range 0	- 3.375V		- 4.125V	
	- 8 γ	Range 0	- 4.5 V		- 5.5 V	

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TEST DATA

PARAGRAPH NUMBER		TEST PARAMETER		TOLERANCE OR LIMIT			REMARKS
				MINIMUM	ACTUAL	MAXIMUM	
3.8.6.3	"Y"	10 Y	Range 1	.703V		.859V	
		20 Y	Range 1	1.404V		1.716V	
		30 Y	Range 1	2.106V		2.574V	
		40 Y	Range 1	2.817V		3.433V	
		50 Y	Range 1	3.519V		4.301V	
		60 Y	Range 1	4.221V		5.159V	ORIGINAL PAGE IS OF POOR QUALITY
		-10 Y	Range 1	- .703V		- .859V	
		-20 Y	Range 1	- 1.404V		- 1.716V	
		-30 Y	Range 1	- 2.106V		- 2.574V	
		-40 Y	Range 1	- 2.817V		- 3.443V	
		-50 Y	Range 1	- 3.519V		- 4.301V	
		-60 Y	Range 1	- 4.221V		- 5.159V	
		2 Y	Range 0	1.125V		1.375V	
		4 Y	Range 0	2.25 V		2.75 V	
		6 Y	Range 0	3.375V		4.125V	
		8 Y	Range 0	4.5 V		5.5 V	
		- 2 Y	Range 0	- 1.125V		- 1.375V	
		- 4 Y	Range 0	- 2.25 V		- 2.75 V	
		-6 Y	Range 0	- 3.375V		- 4.125V	
		- 8 Y	Range 0	- 4.5 V		- 5.5 V	

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TEST DATA

PARAGRAPH NUMBER		TEST PARAMETER		TOLERANCE OR LIMIT MINIMUM	ACTUAL	MAXIMUM	REMARKS
3.8.6.3	"Z"	10 γ	Range 1	.703V		.859V	
		20 γ	Range 1	1.404V		1.716V	
		30 γ	Range 1	2.106V		2.574V	
		40 γ	Range 1	2.817V		3.433V	
		50 γ	Range 1	3.519V		4.301V	ORIGINAL PAGE IS OF POOR QUALITY
		60 γ	Range 1	4.221V		5.159V	
		-10 γ	Range 1	- .703V		- .859V	
		-20 γ	Range 1	- 1.404V		- 1.716V	
		-30 γ	Range 1	- 2.106V		- 2.574V	
		-40 γ	Range 1	- 2.817V		- 3.443V	
		-50 γ	Range 1	- 3.519V		- 4.301V	
		-60 γ	Range 1	- 4.221V		- 5.159V	
		2 γ	Range 0	1.125V		1.375V	
		4 γ	Range 0	2.25 V		2.75 V	
		6 γ	Range 0	3.375V		4.125V	
		8 γ	Range 0	4.5 V		5.5 V	
		- 2 γ	Range 0	- 1.125V		- 1.375V	
		- 4 γ	Range 0	- 2.25 V		- 2.75 V	
		-6 γ	Range 0	- 3.375V		- 4.125V	
		- 8 γ	Range 0	- 4.5 V		- 5.5 V	

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TEST DATA

PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT			REMARKS
		MINIMUM	ACTUAL	MAXIMUM	
3.8.7.2	X	- .1 V		.1 V	
	Y	- .1 V		.1 V	
	Z	- .1 V		.1 V	
3.8.7.3	X Output	4.22 V		5.14 V	
3.8.7.4	Oper. Range LED	ON		ON	
	X Output	.57 V		.69 V	
3.8.7.5	Over Range LED	OFF		OFF	
3.8.7.6	Over Range LED	ON		ON	
3.8.7.7	Oper. Range LED	ON		ON	
3.8.7.8	Oper. Range LED	OFF		OFF	
	X Output	3.35 V		4.15 V	

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TEST DATA

PARAGRAPH NUMBER		TEST PARAMETER	TOLERANCE OR LIMIT			REMARKS
			MINIMUM	ACTUAL	MAXIMUM	
3.8.7.9	(3.8.7.3)	X Output	4.22 V		5.14 V	
	(3.8.7.4)	Oper. Range LED	ON		ON	
		X Output	.57 V		.69 V	
	(3.8.7.5)	Over Range LED	OFF		OFF	
	(3.8.7.6)	Over Range LED	ON		ON	
	(3.8.7.7)	Oper. Range LED	ON		ON	
	(3.8.7.8)	Oper. Range LED	OFF		OFF	
		X Output	3.35 V		4.15 V	
3.8.7.10	(3.8.7.3)	Y Output	4.22 V		5.[illegible] V	
	(3.8.7.4)	Oper. Range LED	ON		ON	
		Y Output	.57 V		.69 V	
	(3.8.7.5)	Over Range LED	OFF		OFF	

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TEST DATA

PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT MINIMUM	ACTUAL	MAXIMUM	REMARKS
3.7.10 (Cont.) (3.8.7.6)	Over Range LED	ON		ON	
(3.8.7.7)	Oper. Range LED	ON		ON	
(3.8.7.8)	Oper. Range LED	OFF		OFF	
	Y Output	3.35 V		4.15 V	
(3.8.7.9) (3.8.7.3)	Y Output	4.22 V		5.14 v	
(3.8.7.4)	Oper. Range LED	ON		ON	
	Y Output	.57 V		.69 V	
(3.8.7.5)	Over Range LED	OFF		OFF	
(3.8.7.6)	Over Range LED	ON		ON	
(3.8.7.7)	Oper. Range LED	ON		ON	
(3.8.7.8)	Oper. Range LED	OFF		OFF	
	Y Output	3.35 V		4.15 V	

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PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT MINIMUM	ACTUAL	MAXIMUM	REMARKS
3.8.7.10 (3.8.7.3)	Z Output	4.[illegible] V		5.14 V	
(3.8.7.4)	Oper. Range LED	ON		ON	ORIGINAL PAGE IS OF POOR QUALITY
	Z Output	.57 V		.69 V	
(3.8.7.5)	Over Range LED	OFF		OFF	
(3.8.7.6)	Over Range LED	ON		ON	
(3.8.7.7)	Oper. Range LED	ON		ON	
(3.8.7.8)	Oper. Range LED	OFF		OFF	
	Z Output	3.35 V		4.15 V	
(3.8.7.9) (3.8.7.3)	Z Output	4.22 V		5.14 V	
(3.8.7.4)	Oper. Range LED	ON		ON	
	Z Output	.57 V		.69 V	
(3.8.7.5)	Over Range LED	OFF		OFF	

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TEST DATA

PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT			REMARKS
		MINIMUM	ACTUAL	MAXIMUM	
3.8.7.10 (Cont.) (3.8.7.6)	Over Range LED	ON		ON	
(3.8.7.7)	Oper. Range LED	ON		ON	
(3.8.7.8)	Oper. Range LED	OFP		OFF	
	Z Output	3.35 V		4.15 V	

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TEST DATA

PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT MINIMUM	ACTUAL	MAXIMUM	REMARKS
3.8.8.1	(3.6.5.10) Range 1 "X"	3.2 γ		4.8 γ	
	(3.6.5.11) Range 1 "Y"	3.2 γ		4.8 γ	
	Range 1 "Z"	3.2 γ		4.8 γ	
	(3.6.5.13) Range 0 "X"	0.4 γ		0.6 γ	
	"Y"	0.4 γ		0.6 γ	
	"Z"	0.4 γ		0.6 γ	
3.8.9.1	(3.6.5.1) X	-.1 V		.1 V	
	Y	-.1 V		.1 V	
	Z	-.1 V		.1 V	
	(3.6.5.3) X	- 2.25 V		- 2.75 V	
	Y	- 2.25 V		- 2.75 V	
	Z	- 2.25 V		- 2.75 V	
	X	+ 2.25 V		+ 2.75 V	
	Y	+ 2.25 V		+ 2.75 V	
	Z	+ 2.25 V		+ 2.75 V	
	(3.6.5.5) X	-.05 V		.05 V	
	Y	-.05 V		.05 V	
	Z	-.05 V		.05 V	

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TEST DATA

PARAGRAPH NUMBER	TEST PARAMETER		TOLERANCE OR LIMIT			REMARKS
			MINIMUM	ACTUAL	MAXIMUM	
3.8.9.1 (Continued)	(3.6.5.7)	X	- 2.25 V		- 2.75 V	
		Y	- 2.25 V		- 2.75 V	
		Z	- 2.25 V		- 2.75 V	
		X	+ 2.25 V		+ 2.75 V	
		Y	+ 2.25 V		+ 2.75 V	
		Z	+ 2.25 V		+ 2.75 V	
3.8.10.5	-3 db	X	10 Hz		15 Hz	
3.8.10.6	-3 db	Y	10 Hz		15 Hz	
		Z	10 Hz		15 Hz	
3.8.10.9	-3 db	X	10 Hz		15 Hz	
		Y	10 Hz		15 Hz	
		Z	10 Hz		15 Hz	

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PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT MINIMUM	ACTUAL	MAXIMUM	REMARKS
3.8.13.2	Ign. Inhibit	ON		ON	
	Ign. Status	ON		ON	
	Other LEDS	OFF		OFF	
	Signal Status	ON		ON	
3.6.13.3	P.A. LED	ON		ON	
	Other LEDS	OFF		OFF	
3.8.13.4	Manual Range LED	ON		ON	

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TEST DATA

PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT			REMARKS
		MINIMUM	ACTUAL	MAXIMUM	
3.8.13.5	Oper. Range LED	ON		ON	
3.8.13.6	CMD IFC LED	ON		ON	
3.8.13.7	Auto IFC LED	ON		ON	

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TEST DATA

PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT			REMARKS
		MINIMUM	ACTUAL	MAXIMUM	
3.8.1.3	HSK No. 1	3.55 V		4.05 V	
3.8.1.4	HSK No. 1 1.	3.55 V		4.05 V	
	2.	3.55 V		4.05 V	
	3.	3.55 V		4.05 V	
	4.	3.55 V		4.05 V	
	5.	3.55 V		4.05 V	
	6.	3.55 V		4.05 V	
	7.	3.55 V		4.05 V	
	8.	3.55 V		4.05 V	
	9.	3.55 V		4.05 V	
	10.	3.55 V		4.05 V	

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TEST DATA

PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT MINIMUM	ACTUAL	MAXIMUM	REMARKS
3.8.3.1	Bias V.	- 6.22 V		- 6.5 V	
	Ref. V.	- 8.0 V		- 8.36 V	
	3.75 V	3.675V		3.825V	
	-3.75 V	- 3.675V		- 3.825V	
	12.0 V	11.4 V		12.6 V	
	-12.0 V	-11.4 V		- 12.6 V	
	+12 V_{rf}	11.9 V		12.1 V	
	6.3 V	5.7 V		6.9 V	
	-6.3 V	- 5.7 V		- 6.9 V	
	10 V	9.5 V		10.5 V	
	32 V	30.4 V		33.6 V	
3.8.3.2	$I_{28\ V}$ J1-3, 4	--		150 mA	
3.8.4.2	HSK No. 4	- .7 V		.7 V	

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3.8.14.3 +60° C

TEST DATA

PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT MINIMUM	ACTUAL	MAXIMUM	REMARKS
3.8.4.3	J1-2, 6	--		--	
3.8.4.4	HSK No. 4	4.6 V		5.0 V	
	I_{Heater}	32 mA		40 mA	
3.8.5.1	HSK No. 0	--		0.1 V	OFF
		1.7 V		2.3 V	ON
	1	--		0.1 V	OFF
		3.55 V		4.05 V	ON
	2	2.5 V		3.5 V	OFF
		2.5 V		3.5 V	ON
	3	2.5 V		3.5 V	OFF
		2.5 V		3.5 V	ON
	4	--		0.7 V	OFF
		4.3 V		5.3 V	ON
	5	2.0 V		2.4 V	
	6	1.4 V		1.8 V	
	7	1.4 V		1.8 V	

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PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT			REMARKS
		MINIMUM	ACTUAL	MAXIMUM	
3.8.6.2	X	-.05 V		.05 V	
	Y	-.05 V		.05 V	
	Z	-.05 V		.05 V	

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PARAGRAPH NUMBER	TEST PARAMETER		TOLERANCE OR LIMIT MINIMUM	ACTUAL	MAXIMUM	REMARKS
3.8.6.3 "X"	10 γ	Range 1	.703V		.859V	
	20 γ	Range 1	1.404V		1.716V	
	30 γ	Range 1	2.106V		2.574V	
	40 γ	Range 1	2.817V		3.433V	
	50 γ	Range 1	3.519V		4.301V	
	60 γ	Range 1	4.221V		5.159V	
	-10 γ	Range 1	- .703V		- .859V	
	-20 γ	Range 1	- 1.404V		- 1.716V	
	-30 γ	Range 1	- 2.106V		- 2.574V	
	-40 γ	Range 1	- 2.817V		- 3.443V	
	-50 γ	Range 1	- 3.519V		- 4.301V	
	-60 γ	Range 1	- 4.221V		- 5.159V	
	2 γ	Range 0	1.125V		1.375V	
	4 γ	Range 0	2.25 V		2.75 V	
	6 γ	Range 0	3.375V		4.125V	
	8 γ	Range 0	4.5 V		5.5 V	
	- 2 γ	Range 0	- 1.125V		- 1.375V	
	- 4 γ	Range 0	- 2.25 V		- 2.75 V	
	-6 γ	Range 0	- 3.375V		- 4.125V	
	- 8 γ	Range 0	- 4.5 V		- 5.5 V	

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PARAGRAPH NUMBER	TEST PARAMETER		TOLERANCE OR LIMIT			REMARKS
			MINIMUM	ACTUAL	MAXIMUM	
3.8.6.3 "Y"	10 γ	Range 1	.703V		.859V	
	20 γ	Range 1	1.404V		1.716V	
	30 γ	Range 1	2.106V		2.574V	
	40 γ	Range 1	2.817V		3.433V	
	50 γ	Range 1	3.519V		4.301V	
	60 γ	Range 1	4.221V		5.159V	
	-10 γ	Range 1	- .703V		- .859V	
	-20 γ	Range 1	- 1.404V		- 1.716V	
	-30 γ	Range 1	- 2.106V		- 2.574V	
	-40 γ	Range 1	- 2.817V		- 3.443V	
	-50 γ	Range 1	- 3.519V		- 4.301V	
	-60 γ	Range 1	- 4.221V		- 5.159V	
	2 γ	Range 0	1.125V		1.375V	
	4 γ	Range 0	2.25 V		2.75 V	
	6 γ	Range 0	3.375V		4.125V	
	8 γ	Range 0	4.5 V		5.5 V	
	- 2 γ	Range 0	- 1.125V		- 1.375V	
	- 4 γ	Range 0	- 2.25 V		- 2.75 V	
	-6 γ	Range 0	- 3.375V		- 4.125V	
	- 8 γ	Range 0	- 4.5 V		- 5.5 V	

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PARAGRAPH NUMBER	TEST PARAMETER		TOLERANCE OR LIMIT			REMARKS
			MINIMUM	ACTUAL	MAXIMUM	
3.8.6.3 "Z"	10 γ	Range 1	.703V		.859V	
	20 γ	Range 1	1.404V		1.716V	
	30 γ	Range 1	2.106V		2.574V	
	40 γ	Range 1	2.817V		3.433V	
	50 γ	Range 1	3.519V		4.301V	
	60 γ	Range 1	4.221V		5.159V	
	-10 γ	Range 1	- .703V		- .859V	
	-20 γ	Range 1	- 1.404V		- 1.716V	
	-30 γ	Range 1	- 2.106V		- 2.574V	
	-40 γ	Range 1	- 2.817V		- 3.443V	
	-50 γ	Range 1	- 3.519V		- 4.301V	
	-60 γ	Range 1	- 4.221V		- 5.159V	
	2 γ	Range 0	1.125V		1.375V	
	4 γ	Range 0	2.25 V		2.75 V	
	6 γ	Range 0	3.375V		4.125V	
	8 γ	Range 0	4.5 V		5.5 V	
	- 2 γ	Range 0	- 1.125V		- 1.375V	
	- 4 γ	Range 0	- 2.25 V		- 2.75 V	
	-6 γ	Range 0	- 3.375V		- 4.125V	
	- 8 γ	Range 0	- 4.5 V		- 5.5 V	

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PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT			REMARKS
		MINIMUM	ACTUAL	MAXIMUM	
3.8.7.2	X	-.1 V		0.1 V	
	Y	-.1 V		0.1 V	
	Z	-.1 V		0.1 V	
3.8.7.3	X Output	4.22 V		5.14 V	
3.8.7.4	Oper. Range LED	ON		ON	
	X Output	.57 V		.69 V	
3.8.7.5	Over Range LED	OFF		OFF	
3.8.7.6	Over Range LED	ON		ON	
3.8.7.7	Oper. Range LED	ON		ON	
3.8.7.8	Oper. Range LED	OFF		OFF	
	X Output	3.35 V		4.15 V	

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PARAGRAPH NUMBER		TEST PARAMETER	TOLERANCE OR LIMIT			REMARKS
			MINIMUM	ACTUAL	MAXIMUM	
3.8.7.9	(3.8.7.3)	X Output	4.22 V		5.14 V	
	(3.8.7.4)	Oper. Range LED	ON		ON	
		X Output	.57 V		.69 V	
	(3.8.7.5)	Over Range LED	OFF		OFF	
	(3.8.7.6)	Over Range LED	ON		ON	
	(3.8.7.7)	Oper. Range LED	ON		ON	
	(3.8.7.8)	Oper. Range LED	OFF		OFF	
		X Output	3.35 V		4.15 V	
3.8.7.10	(3.8.7.3)	Y Output	4.22 V		5.14 V	
	(3.8.7.4)	Oper. Range LED	ON		ON	
		Y Output	.57 V		.69 V	
	(3.8.7.5)	Over Range LED	OFF		OFF	

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PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT MINIMUM	ACTUAL	MAXIMUM	REMARKS
3.8.7.10 (Cont.) (3.8.7.6)	Over Range LED	ON		ON	
(3.8.7.7)	Oper. Range LED	ON		ON	
(3.8.7.8)	Oper. Range LED	OFF		OFF	
	Y Output	3.35 V		4.15 V	
(3.8.7.9) (3.8.7.3)	Y Output	4.22 V		5.14 v	
(3.8.7.4)	Oper. Range LED	ON		ON	
	Y Output	.57 V		.69 V	
(3.8.7.5)	Over Range LED	OFF		OFF	
(3.8.7.6)	Over Range LED	ON		ON	
(3.8.7.7)	Oper. Range LED	ON		ON	
(3.8.7.8)	Oper. Range LED	OFF		OFF	
	Y Output	3.35 V		4.15 V	

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PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT MINIMUM	ACTUAL	MAXIMUM	REMARKS
3.8.7.10 (3.8.7.3)	Z Output	4.22 V		5.14 V	
(3.8.7.4)	Oper. Range LED	ON		ON	
	Z Output	.57 V		.69 V	
(3.8.7.5)	Over Range LED	OFF		OFF	
(3.8.7.6)	Over Range LED	ON		ON	
(3.8.7.7)	Oper. Range LED	ON		ON	
(3.8.7.8)	Oper. Range LED	OFF		OFF	
	Z Output	3.35 V		4.15 V	
(3.8.7.9) (3.8.7.3)	Z Output	4.22 V		5.14 V	
(3.8.7.4)	Oper. Range LED	ON		ON	
	Z Output	.57 V		.69 V	
(3.8.7.5)	Over Range LED	OFF		OFF	

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PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT			REMARKS
		MINIMUM	ACTUAL	MAXIMUM	
3.8.7.10 (Cont.) (3.8.7.6)	Over Range LED	ON		ON	
(3.8.7.7)	Oper. Range LED	ON		ON	
(3.8.7.8)	Oper. Range LED	OFF		OFF	
	Z Output	3.35 V		4.15 V	

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PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT MINIMUM	ACTUAL	MAXIMUM	REMARKS
3.8.8.1	(3.6.5.10) Range 1 "X"	3.2 γ		4.3 γ	
	(3.6.5.11) Range 1 "Y"	3.2 γ		4.8 γ	
	Range 1 "Z"	3.2 γ		4.8 γ	
	(3.5.5.13) Range 0 "X"	0.4 γ		0.6 γ	
	"Y"	0.4 γ		0.6 γ	
	"Z"	0.4 γ		0.6 γ	
3.8.9.1	(3.6.5.1) X	-.1 V		.1 V	
	Y	-.1 V		.1 V	
	Z	-.1 V		.1 V	
	(3.6.5.3) X	- 2.25 V		- 2.75 V	
	Y	- 2.25 V		- 2.75 V	
	Z	- 2.25 V		- 2.75 V	
	X	+ 2.25 V		+ 2.75 V	
	Y	+ 2.25 V		+ 2.75 V	
	Z	+ 2.25 V		+ 2.75 V	
	(3.6.5.5) X	-.05 V		.05 V	
	Y	-.05 V		.05 V	
	Z	-.05 V		.05 V	

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PARAGRAPH NUMBER	TEST PARAMETER		TOLERANCE OR LIMIT			REMARKS
			MINIMUM	ACTUAL	MAXIMUM	
3.8.9.1 (Continued)	(3.6.5.7)	X	-2.25 V		-2.75 V	
		Y	-2.25 V		-2.75 V	
		Z	-2.25 V		-2.75 V	
		X	+2.25 V		+2.75 V	
		Y	+2.25 V		+2.75 V	
		Z	+2.25 V		+2.75 V	
3.8.10.5	-3 db	X	10 Hz		15 Hz	
3.8.10.6	-3 db	Y	10 Hz		15 Hz	
		Z	10 Hz		15 Hz	
3.8.10.9	-3 db	X	10 Hz		15 Hz	
		Y	10 Hz		15 Hz	
		Z	10 Hz		15 Hz	

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PARAGRAPH NUMBER	TEST PARAMETER	TOLERANCE OR LIMIT			REMARKS
		MINIMUM	ACTUAL	MAXIMUM	
3.8.13.2	Ign. Inhibit	ON		ON	
	Ign. Status	ON		ON	
	Other LEDS	OFF		OFF	
	Signal Status	ON		ON	
3.8.13.3	P.A. LED	ON		ON	
	Other LEDS	OFF		OFF	
3.8.13.4	Manual Range LED	ON		ON	
3.8.13.5	Oper. Range LED	ON		ON	
3.8.13.6	CMD IFC LED	ON		ON	
3.8.13.7	Auto IFC LED	ON		ON	

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